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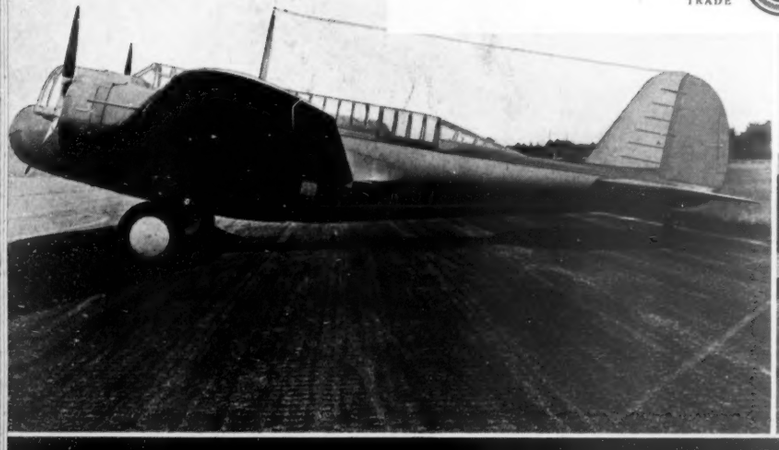

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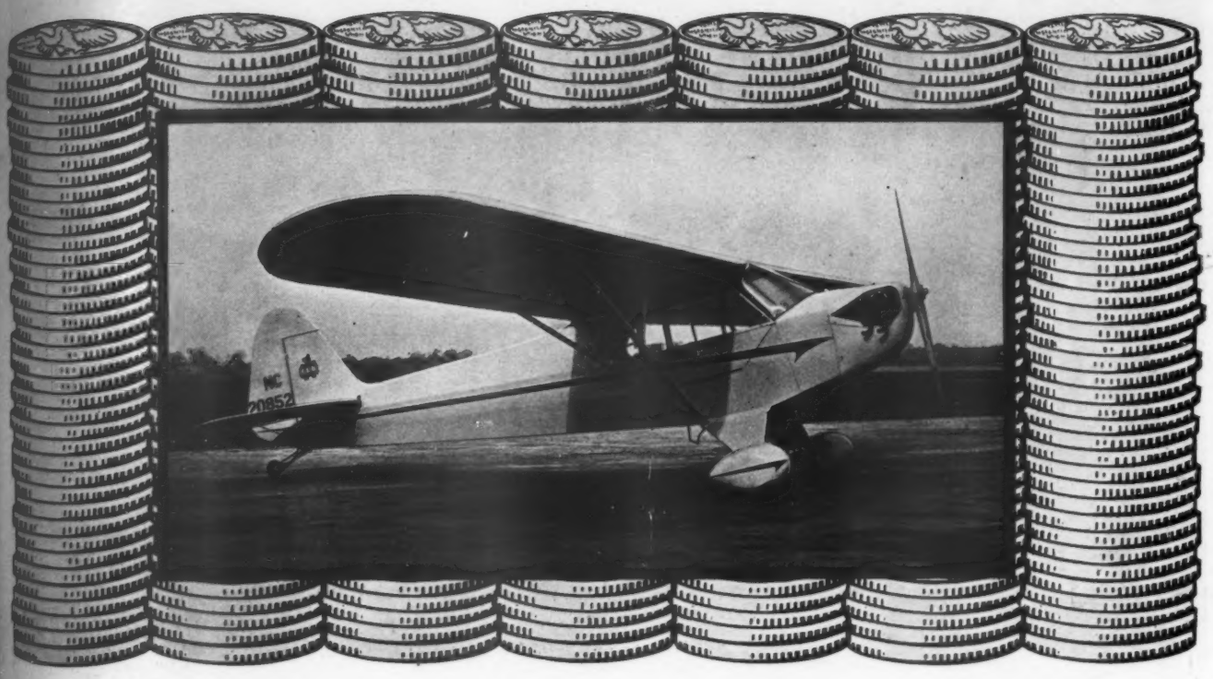

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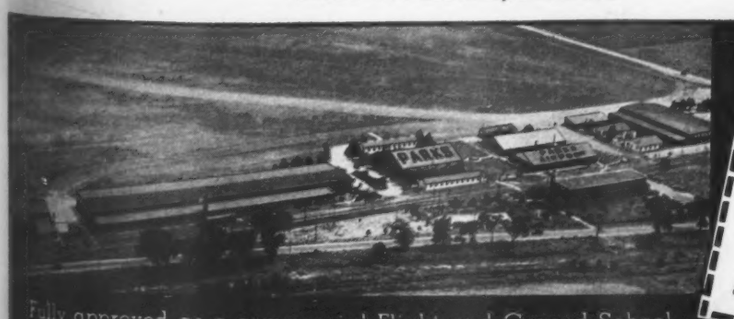

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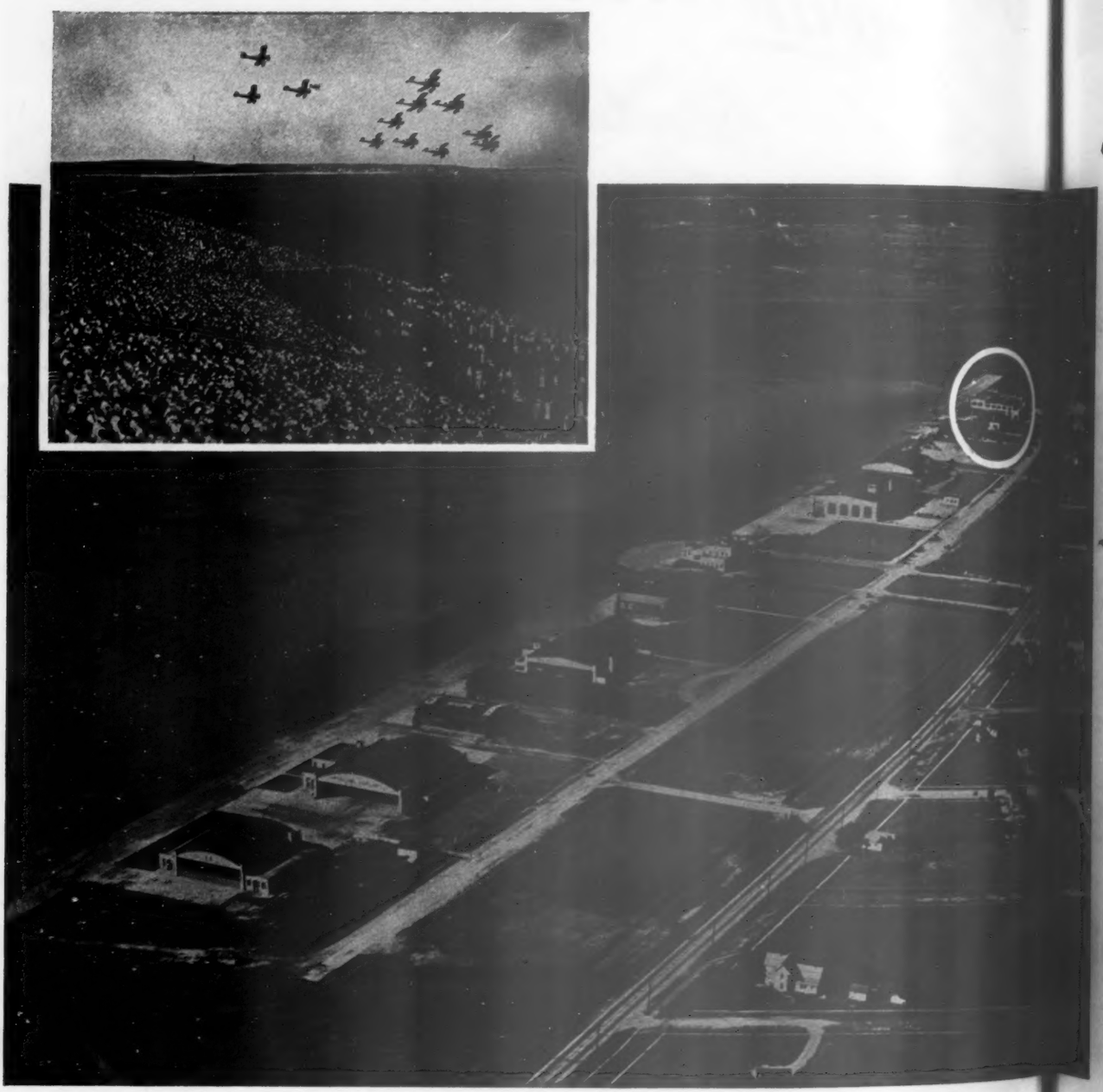

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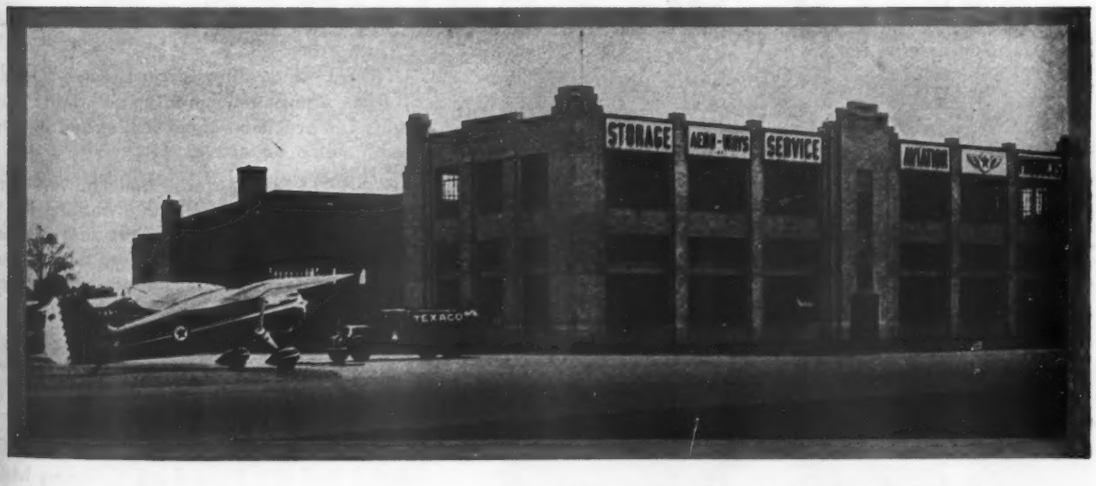

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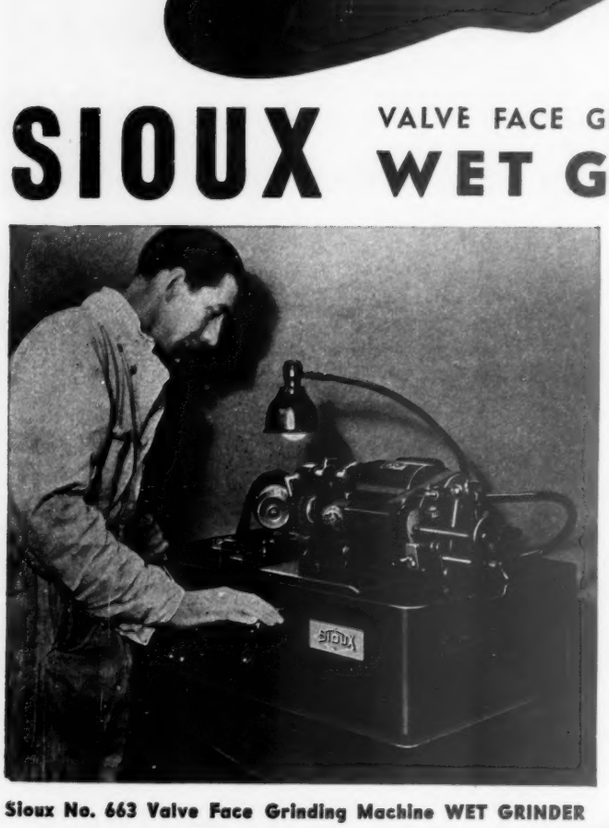

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GRADUATION and PLACEMENT RECORD
(July 1937—June 1938)

Months	Number Graduated	Number Placements	No. Co.'s Employing Graduates
1937			
July	5	7	2
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
Feb.	1	9	7
Mar.	40	16	6
Apr.	6	13	3
May	6	12	6
June	30	5	4
TOTAL	154	107	26

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AVIATION

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Beechcraft for Export

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AMERICA'S PILOTS IN THE KENDALL HALL OF FAME

S. J. WITTMAN, of OSHKOSH, WIS.

During the past ten years, wherever planes were racing, wherever the supreme tests of speed, endurance and flying sportsmanship took place, there Mr. Wittman has been found in one of his famous planes, the Chief or Bonzo. Operator of a flying school, barnstormer, test pilot, airport manager, transcontinental racer, annual participant and many times winner in the National Air Races, breaker of speed marks and holder of world's records, Mr. Wittman is an outstanding member of aviation's hall of fame. Of Kendall's Hall of Fame, too, for in his great achievements, Mr. Wittman depends on Kendall Oil for reliable lubrication.

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From the Skyways of the World

» ADD PAUL KOLLSMAN to the growing list of important people who have served U. S. aviation continuously and well for a decade. Just 10 years ago he broke away from a job he didn't like, rented an attic room, bought a second-hand lathe, drill press and vacuum pump and went to work as the Kollsman Instrument Company,—a strictly one-man show.

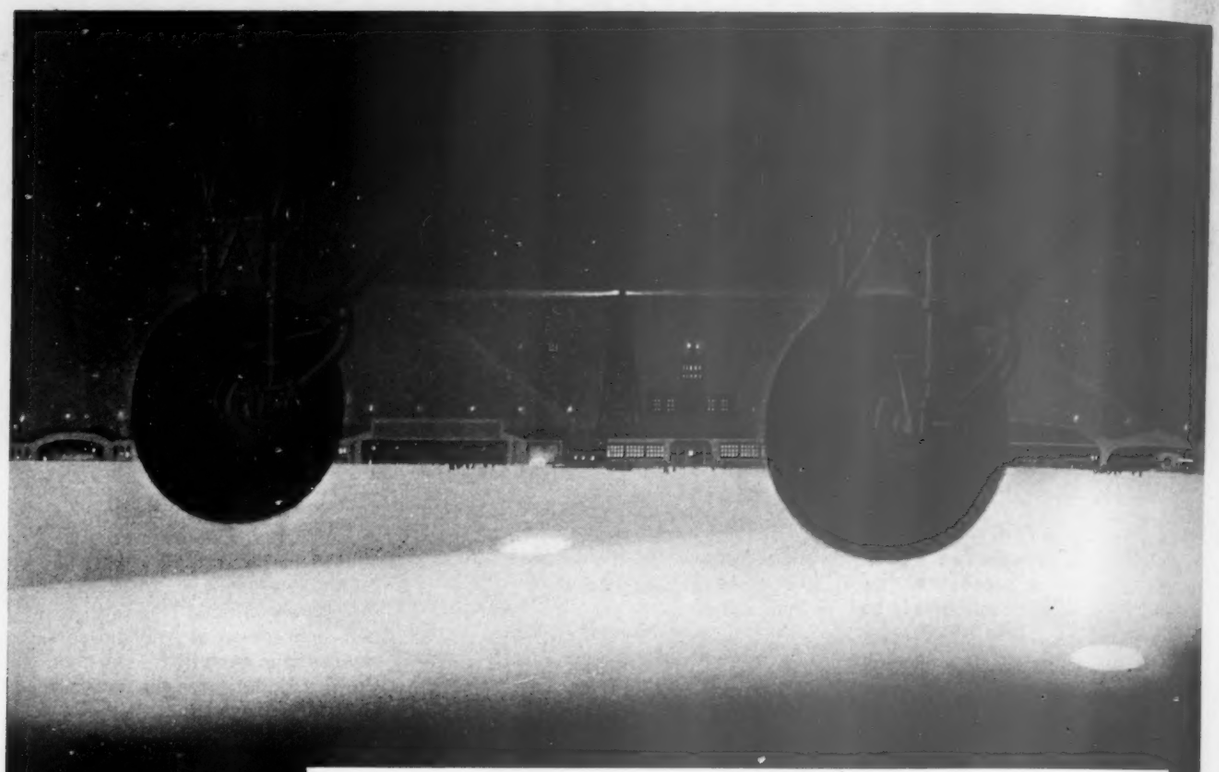
Today few names are more common in routine aviation parlance,—for "Kollsman readings" are given to every airline pilot for every landing. The name has become synonymous with the sensitive altimeters found on practically all aircraft instrument boards and in most ground stations.

In the ten years between, Kollsman's one-man company has expanded tremendously. From attic room it has passed through several stages to its splendid 70,000 square foot factory in Elmhurst where over 300 people are now at work on aircraft instruments of many kinds. But Paul Kollsman still finds time to direct its manifold activities personally. Visitors dropping in are more likely to find down in the shop in shirt sleeves working at a bench over some delicate mechanical problem with his long-time associate Walter Angst, or deep in a technical session with his Chief Engineer Vic Carbonara and his right hand factory man Charlie Colvin, rather than doing the executive act in his handsome office.

» WHEN PEOPLE FEEL LIKE GETTING MARRIED nothing seems too silly to try, judging from the number of couples who have been known to take a clergyman aloft with them for a marriage in the air. But a new twist was given the stunt recently when Edward L. von Glatte, of Hollywood, induced Captain Richard Bowman to take him up to 16,000 ft. (above the three mile limit) in a United Mainliner over Union Air Terminal, Burbank, and there to perform a ceremony which United him (or did it?) with the present Mrs. Jane Webster von Glatte (or is she?). It is all very confusing, for the Los Angeles County recorder refused to record the marriage, and Mrs. von Glatte (or Miss Webster) is now sueing her husband (or at least Mr. von Glatte) to determine what her status is. The suit is friendly. In fact, Mr. and Mrs. von Glatte were last reported on a honeymoon via United Airlines to Chicago.

» VISITATIONS OF THE MONTH: To Corry, Penna., to chin a bit with S. J. Irvine of Aero Supply, and to look over his busy factory. Many bolts, fittings, fuel accessories and other items of aircraft hardware bear the A-S stamp. . . . At Lockhaven for a pleasant afternoon with Messrs. Piper and Weld at the Cub factory. They've done an amazingly good job in production and materials handling at the new factory, and the Cubs are rolling out the back door at a great rate. . . . Missed Dick Palmer by a half hour or so at Williamsport, but was taken in hand by his assistant, Mr. Cowden, and given a fine tour through Lycoming's (Aviation Mfg. Co.) engine and propeller departments.

"With a load on, Maguire always takes-off piggy-back!"



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Because the milder shocks encountered in taxi-ing an airplane differ in character and in degree of severity from those sustained through landing impact, they demand separate resources of shock-absorption. Bendix provides them. Bendix Pneudraulic Shock Struts soak up the initial blows of first ground contact through hydraulic cushioning, then absorb the lesser bumps of taxi-ing by means of air. Both functions are calibrated with precision, to achieve best possible results with the individual airplane's weight and normal landing speed. Responsive control of direction and velocity is furnished by Bendix Airplane Brakes. Unquestionably, Bendix is best able to help correlate these factors with all the other elements of your plane's design when given an early opportunity to work with you.

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Side Slips

By
ROBERT
OSBORN

» DOUGLAS CORRIGAN certainly added much to the gaiety of nations at a time when relaxation of international tension was sadly needed, and he provided columnists, editors, and radio commentators with a fertile field for thousands of quips. Most of the commentators seemed to think that his "wrong-way" flight was something unique in the history of aviation, not realizing that Mr. Levine was the originator of that style of flying. You will probably recall that way back in 1927 Mr. Levine planned a return

flight from Paris to New York but flew toward India instead as he thought "the weather was better in that direction."

» CORRIGAN'S FLIGHT was novel in one way, however. Most history-making flights are followed by a large number of advertisements by the manufacturers of accessories which contributed toward its success, but so far no manufacturer has proclaimed that it was his compass which "stuck in the wrong direction" until just before Corrigan landed in Ireland.

» DOUBTLESS THE PUBLICITY will earn Mr. Corrigan a good position somewhere in the field of aeronautics, and we certainly hope it does. Our only comment would be that his peculiar talents do not fit him for the job as pilot of either plane in the Mayo "Pick-a-back" arrangement,—no telling what would happen if those tandem airplanes started for different destinations right in the middle of the take-off run.

» IN ONE of his excellent speeches following his record-breaking flight around the world, Howard Hughes predicted that trans-oceanic planes will some day be almost as large as present-day ocean liners. When the time comes to build the flying ocean liner we'll be expecting it to be designed on the drafting board of Waldo Waterman. Having rebuilt a Standard into a "flying locomotive" for the 1928 Air Races, and having brought out his "flying automobile" recently, the conversion of an ocean liner seems the next logical step for him.

» AN ASSOCIATED PRESS DISPATCH describing the use of target planes for anti-aircraft gunnery practice states: "British gunners for two or three years have been firing at a full size radio-controlled plane, the Queen Bee, operated by the Royal Air Force. Officials said it had been brought down a number of times, patched up, and used over again."

Unconfirmed reports have it that one time after this target plane had been brought down, the R.A.F. officials were surprised to find Bob Burns' Grandpa Snazzy in it, frying eggs.

» WE SEE BY THE PAPERS that the government publication "Infant Care" now includes some hints on the care of the baby while traveling by air. This booklet has been the government's best seller since 1914, when it outdistanced the previous best seller, "The Care of the Horse." This latter publication could be made popular again, at least among areonautical

people, if the title were changed to "The Care of the Horses" and a few chapters added on carburetors, superchargers, magnetos, and fuel and oil systems.

» AN AUTOMOBILE MANUFACTURER recently found a farmer using the engine of one of his earliest models to operate a water pump, the seats were serving as porch furniture and the wheels were on a hay wagon. He proudly advertised that you could dissect one of his cars but you couldn't kill it.

With each recurring boom in the airplane business the used airplane problem becomes more serious and we are glad to note that many novel uses have been discovered for retired models. Some of the old airplanes are serving as hot dog stands and filling stations which is undignified but at least useful. One old model has been mounted on top of a forty-foot steel tower in the middle of an Ohio orchard, where it is used to keep a breeze blowing over the tree tops to prevent freezing from frost.

Then, of course, there is that other owner who found a novel use for an old plane when he flew it from New York to Ireland.

100
THOMPSON TROPHY

AVIATION *for September, 1938* ★ ★ ★ ★ ★

"AVIATION ON PARADE"

COME LABOR DAY WEEK-END, and the National Air Races,—events that have become practically synonymous in aviation circles. What with a shorter, snappier program, a brand new set of rules, and a total purse well over $100,000, the annual race meet at Cleveland has attracted the largest and most promising list of starters in the three major events for many a year. According to the dope sheet of our trusty Agent 1313-X (Page 21) both the factory and the back-yard-built jobs should put up performances that will bear watching.

And, although we are a bit weary of doing so, we can't let this occasion pass without dragging out and dusting off our annual plea for less of the circus atmosphere and more real aviation promotion at the races. Jittering, spine-chilling loud-speaker build-ups liberally salted with too, too obvious "commercials", and the spectacle of death-defying automobile acts certainly lend nothing to the real purpose of the occasion nor contribute one whit to the advancement of aviation. If the real purpose of the race sponsors is to provide a yearly pageant of "Aviation on Parade" there should be better ways of doing so than by a repetition of the old "sky-buster" technique. Nobody knows that something different won't work, for it's never been tried.

Here's looking at you, Cliff!

DUAL OR DUEL?

TO WASHINGTON again betimes, principally to meet the members of the CAA and to see how soon they may be expected to get their teeth into some of this industry's pressing problems now that they have been sworn in and are ready to take-over. We found things much as we expected. Individually, members of the Authority are men of high calibre filled with a desire to be of Public Service, all sincerely—almost pathetically—eager to find out for themselves what this aviation business is all about. Clearly, all of them have been more than a little impressed, if not a bit appalled, by the magnitude of the job which they have accepted. To a man, however, they express a grim determination to do right by our Nell.

All of which is encouraging, but doesn't change in the least the opinion we expressed last month that we are facing another hiatus in aviation progress. How long it will last will depend on the capacity of the Authority to absorb and to digest the great mass of information, misinformation, special pleas, requests for jobs, etc., etc. that is already being dished up to it. With so little first-hand knowledge in the Authority itself much will depend upon the character of the people to whom the members turn for necessary council and advice. And in spite of our desire to see things moving forward again, we hope that the CAA will move slowly enough to find the right answers, and not get things away on the wrong foot.

But the most critical spot as we see it now lies within the organization of the Authority itself. The law as written is not any too lucid on the relationship between the Administrator and the Chairman of the Authority. The intent, obviously, was to vest the active executive functions in the Administrator, who becomes, in effect, a super Director of Air Commerce. His the job to inaugurate new projects and to carry them through within the limits set by the law. The five-man board, on the other hand, occupies a quasi-judicial position, to hear appeals on rates and routes and other matters from members of the aviation industry, and generally to pass upon the legality of the acts performed by the administrator. All of which is fine, as long as it works that way, but Washington gossip already hints at conflicting ideas on the subject between Chairman and Administrator. If Mr. Noble intends to use his new job as a springboard to bigger and better things *à la* Joe Kennedy (and we can't believe entirely that he took over out of sheer love for aviation) he must inevitably compete with the Administrator for the limelight. We are sure, however, that both Mr. Noble and Mr. Hester are big enough men to recognize the unfortunate potentialities of the situation and to subordinate their personal ambitions and their political obligations in the common cause. Above all, we need dual, not duel control.

Fortunately aviation is now in a strategically good position not of its own making. In setting up the CAA the Administration had its eye on a much larger issue, the problem of reorganization of the government. The CAA is a test case, a sort of guinea pig to try out a new idea in commission organization. If it fails to function according to expectations, the whole program of the reorganization boys may do a prattfall in the next session of Congress. That is something that the White House could ill afford to risk, so it goes without saying that every possible effort will be exerted to maintain harmony and close cooperation within the CAA during these most critical months. That, at least, is a break for us.

NATIONAL

1938 Program

RACING EVENTS

Saturday Sept. 3

BENDIX Finish at intervals from noon to 6 P.M.

Plan to start the Bendix Contestants at Los Angeles at frequent intervals, attempting to build a close finish at Cleveland.

Bendix Contestants planning to complete extra leg to Bendix, N. J. required to land and to remain 15 minutes in Cleveland before proceeding.

CONSOLATION RACE for planes failing to qualify in preliminary trials for the Thompson and Greve Trophy Races—50 miles—5 laps over 10-mile course, total purse $2000.

Sunday Sept. 4

GREVE Trophy Race—200 miles—20 laps over 10-mile course, total purse $25,000.

Labor Day, Sept. 5

THOMPSON Trophy Race—300 miles—30 laps over 10-mile course, total purse $45,000.

Army, Navy and Marine Corps

The Army will be represented by 18-plane Seversky Squadron from Selfridge Field, and a specialty team, plus complete ground show of latest fighting and combat equipment.

Navy will have 18 Grumman Fighters from U.S.S. Yorktown.

Marine Corps—18 Grumman Fighters from Quantico, Va.

Acrobatic Exhibitions

Aerobatic exhibitions will be given every day by Count Otto Hagenburg, German; Capt. Alex Papana, Roumanian, in a new routine, including smoke; Hanna Reitsch, 19 year old German girl, acrobatic exhibition in motorless glider.

Emil Kropf, German, in a Feiseler-Storch bi-plane said to have the characteristics of an autogiro, including vertical take-off and landing.

Mike Murphy and Dick Granere in a dual specialty act and later in solo exhibitions.

Art Davis in acrobatic routine. Also, other comedy and specialty exhibitions.

Parachute Jumping

Daily parachute program includes five, six or more delayed runs to the ground from an altitude of 10,000 feet; Spot jumping; mass jumping closing out the program with a minimum of 30 and possibly 40 performers; several specialty acts.

Also included in each days program will be "Aviation on Parade" with full participation of industry and transport lines.

AIR RACES

Revised rules and $100,000 "kitty" are bringing together as great a collection of speed planes and race pilots as ever faced a starting flag.

Impresario Cliff Henderson

Roscoe Turner

Earl Ortman

S. J. Wittman

Jacqueline Cochrane and Major de Seversky

By Charles F. (1313-X) McReynolds

West Coast Editor, AVIATION

ONCE AGAIN the time is at hand when a flock of eccentric young men turn up with clipped wing thunder birds and scare the daylights out of themselves and everyone else with their antics. Elsewhere in this vast and cock-eyed country technicians are busily performing well organized tasks in research laboratories and factories. Langley field is spending millions of dollars of government money on fundamental research. Factories concentrate hundreds of engineers on a single design to meet the specifications of an airline, an army, or a navy. But Benny Howard once remarked that the reason he built racing planes was because it was the only way he knew to build experimental planes and then get them to pay for themselves. So, for better or for worse, some of the money paid in at Cleveland's race course turnstiles is passed along to a growing group of young fellows who win races and then immediately spend their prize money in an effort to build better race planes to win more races, etc., etc.

Not that we can expect many revolutionary changes to spring from such activity. Nor is the structural and aerodynamic engineering of race craft always on a par with good contemporary commercial and military practice. But the way race builders have handled specialized problems dealing with landing gear retraction, fuel and oil tank installation, engine cowling, oil cooling, cockpit ventilation, is often an education in ingenuity. That intangible element Benny Howard calls "go grease" is always liberally applied all round.

Vincent Bendix and Frank Fuller — 1937

This year designers have concentrated their efforts on reliability even more than on increased speed for the planes that will fly the new longer distances in both the Greve and Thompson Trophy races. By concentrating on improved cooling, both of cylinders and lubricating oil, it is believed that engine strain will be materially lessened. And close attention has been given to cockpit comfort and ventilation by practically all designers in order that pilots may fly the longer distances without undue fatigue.

This year we have a rule prohibiting Thompson Trophy racers from competing in the Bendix transcontinental race. As a result, the Bendix this year will be confined almost exclusively to military or commercial types. At this writing we would call the Bendix a two plane race, though a dozen or more planes are listed as possible entrants. Among possible starters are two Seversky's, two Beechcraft, a Lockheed 14, a Spartan Executive, a Lockheed Orion, and the Gee Bee Q.E.D. Frank Fuller should repeat his 1937 victory, flying the cross-country Seversky with which he has set an impressive number of records for point to point flights. But Jacqueline Cochrane, probably the only woman entrant, will also pilot a Seversky. We surmise she is out for blood, and fame, so won't be surprised to see her spring a mild upset and come home a winner in new record time. Late advices indicate that Publisher Bernarr McFadden will try for the Bendix in the Northrop that Jacqueline Cochrane once sought to fly the MacRobertson race, and later used by Howard Hughes to set a transcontinental record. He should rate a "third," if he starts. We can only guess the prospects of the other entrants or prospective entrants, by listing them in the order in which we would expect them to finish: Al Lary flying Jack Wright's Wedell-Williams No. 92; Paul Mantz at the controls of a Lockheed Orion; George Armistead in the Q.E.D.; Bob Perlick with his Cyclone powered Beechcraft; Ross Hadley, also with a Beechcraft; Russell Thaw, pushing Vanderbilt's Lockheed 14; John Hinchey flying a Wasp, Jr. powered Spartan Executive; and Frank Hawks in an un-named entry. It may seem silly to put the veteran speed merchant Hawks, last on the list, but we have no information on his

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"You pays your money and you takes your choice." (These tables

RACE PLANES

Best information available at time of going to press

For complete discussion of other possible entrants see text above

No.	Name	License	Colors	Pilot	Designer	Owner
3	Marcoux-Bromberg	NX14215	Yellow & Black	Earl Ortman	Keith Rider Jack Bromberg	H. C. Marcoux
6	Bonzo	R13688	Red	S. J. Wittman	S. J. Wittman	S. J. Wittman
...	Turner Special	.....	Cream	Roscoe Turner	.....	Roscoe Turner
11	Mr. Smoothie	NX94Y	Orange	Lee Williams	C. R. Pearson Rodney Nimmo	Mrs. E. Clark
...	Wedell-Williams	.....	Cream	Lt. Joe Mackey	James Wedell	Roscoe Turner
...	Folkerts Special	.....	.....	Joe Jacobson	Clayton Folkerts	Joe Jacobson
70	Firecracker	.....	Yellow	Anthony LeVier	Keith Rider Wm. Schoenfeldt	Wm. Schoenfeldt
8	8-Ball	NX96Y	Blue	Roger Don Rae	Keith Rider	Union Airplane Co., Inc.
5	The Goon	NX93Y	Cream	Arthur C. Chester	A. C. Chester	A. C. Chester
...	The Jackrabbit	.....	.....	Earl Ortman Dave Elmendorf	Keith Rider Jack Bromberg	H. C. Marcoux
52	Crosby CR-4	NX92Y	Aluminum	Harry Crosby	Harry Crosby	Harry Crosby
49	Delgado Flash	NX68Y	Black	Clarence McArthur	Byron Armstrong	Delgado Trades School
21	Chambermaid	NX95Y	Yellow	Russell Chambers	Russell Chambers	Russell Chambers
33	Miss Los Angeles	NX255Y	Red	Marion McKeen	Lawrence W. Brown	Marion McKeen
...	Bumble Bee	.....	Silver	Charles McGrew	Keith Rider	Charles McGrew
...	Floyd Racer	.....	.....	Bob Bean	Tom Floyd	Tom Floyd

RACE

1 BENDIX TROPHY

Los Angeles-Cleveland-New York

Total purse $30,000

2 GREVE TROPHY

200 miles, 20 laps

Total purse $25,000

3 THOMPSON TROPHY

300 miles, 30 laps

Total purse $45,000

NO.

ship, and besides, with Al Lary, Ross Hadley, and Russell Thaw, he is a doubtful starter. Other rumored entrants include Roscoe Turner in an unnamed plane; Jacqueline Cochrane's Beechcraft, with an unnamed pilot; Sundorph in his 1937 Sundorph Special; and the Beech, another Seversky, a Howard, and a couple of Lockheeds, all with pilots so far unnamed.

As for the show at Cleveland, a consolation race is scheduled for the opening day, to consist of those planes not among the fastest fifteen qualifying for the Thompson Trophy race. But to the best of our ability to check possible entrants there are only twenty airplanes that have any prospect of getting to Cleveland to enter the qualifying trials. We are not counting on any foreign entries this year, fortunately for the home boys. If Detroyat came back, or if the Germans sent over a couple of their Messerschmidts, the picture would be different, as the best of our race planes are still none too fast when compared with some of the newer European military equipment. However, we are including three baby planes of 375 cu. in. classification in our summation of twenty possibles for the qualifying trials. Its a cinch that a couple of these planes won't reach the scene of action, leaving only eighteen. Since fifteen of these eighteen can start the Thompson, this leaves only three planes to fly the consolation race on the opening day. But the race rules specifically state that "No race will be run with less than four starters" so we expect to see some sort of a substitute race billed for Saturday, if indeed there is any race at all on that day.

On Sunday will come the Greve Trophy race, over the same course and distance as the Thompson Trophy ran last year, twenty laps around the ten mile course. We present our complete formchart elsewhere, but we shall really be surprised if the Greve time does not exceed the best previous Thompson Trophy speed, including Detroyat's race at Los Angeles in 1936, when he flew 150 mi. at an average speed of 264.261 m.p.h.

Although at this writing Joe Jacobson has not yet flown his new Folkerts racer, we must tab him for number one spot in the Greve. This surmise is based on past performances of Folkerts planes, and on the fact that Jacob-

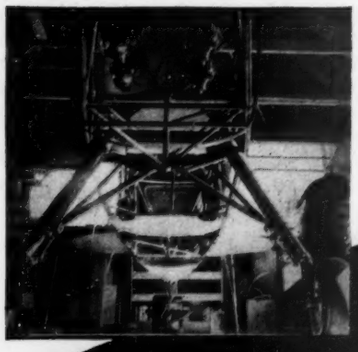
RACING FORM

(based on best available information at the time of going to press)

NO.	PLANE	PILOT	SPEED	REMARKS
1.	Seversky	Frank Fuller		The old maestro—Should repeat.
2.	Seversky	Jacqueline Cochrane		Out to win—may spring upset.
3.	Northrop	Bernarr McFadden		Doubtful starter, but should place.
4.	Wedell-Williams	Al Lary		Just tagging along—but should show.
5.	Lockheed Orion	Paul Mantz		Not enough to win—but should finish.
6.	GeeBee Q.E.D.	Geo. Armistead		Alphabet Soup—A pleasant trip.
7.	Beechcraft	Bob Perlick		Dark horse—may sneak in first.
8.	Beechcraft	Ross Hadley		Doubtful starter—might place high.
9.	Spartan Executive	John Hinchey		A nice plane—but out of its class.
10.	Lockheed 14	Russell Thaw		Doubtful starter—but may pull upset.
11.		Frank Hawks		Doubtful starter.
1.	Folkerts	Joe Jacobson	280 mph	No cinch.
2.	Schoenfeldt	Tony LeVier	279 mph	Might win if running right.
3.	Rider Racer	Roger Don Rae	278 mph	Pilot may be switched, but a good bet.
4.	Chester Goon	Art Chester	277 mph	A tough combination—Look out.
5.	Marcoux Rabbit	Earl Ortman	250 mph	A sweet running chariot—but slow.
6.	Crosby CR-4	Harry Crosby	240 mph	An in and outer—might surprise.
7.	Delgado Flash	Clarence McArthur	229 mph	May fool us and do much better.
8.	Miss Los Angeles	Marion McKeen	225 mph	Good for 240 if in right mood.
9.	Chambermaid	Russ Chambers	200 mph	In fast company and far from home.
10.	Bumble Bee	Charles McGrew	190 mph	First time out but may surprise Russ.
11.	Floyd Special	Bob Bean	189 mph	Doubtful starter—has possibilities.
1.	Marcoux-Bromberg	Earl Ortman	300 mph	We're optimistic here.
2.	Bonzo	S. J. Wittman	290 mph	More optimism—but might do o.k.
3.	Turner Special	Roscoe Turner	275 mph	In the money if can find pylons.
4.	Mr. Smoothie	Lee Williams	274 mph	Dark horse—may beat 300 mph.
5.	Folkerts	Joe Jacobson	273 mph	May do much better.
6.	Schoenfeldt	Tony LeVier	272 mph	Might fool Jacobson—also Ortman.
7.	Rider racer	Roger Don Rae	271 mph	Good enough to beat pack—maybe.
8.	Chester Goon	Art Chester	270 mph	May do better—won't do worse.
9.	Marcoux Rabbit	Dave Elmendorf	260 mph	Sure to finish.
10.	Mod. Wedell-Williams	Lt. Joe Mackey	258 mph	A veteran with lots of speed left.
11.	Crosby CR-4	Harry Crosby	255 mph	In fast company.
12.	Delgado Flash	Clarence McArthur	250 mph	Outclassed.
13.	Brown Special	Marion McKeen	230 mph	Will gamble to finish—but slow.
14.	Chambermaid	Russ Chambers	220 mph	Out for experience—and carfare.
15.	Bumble Bee	Charles McGrew	210 mph	Just for the fun of it.
16.	Floyd Special	Bob Bean	200 mph	Doubtful starter—might finish.

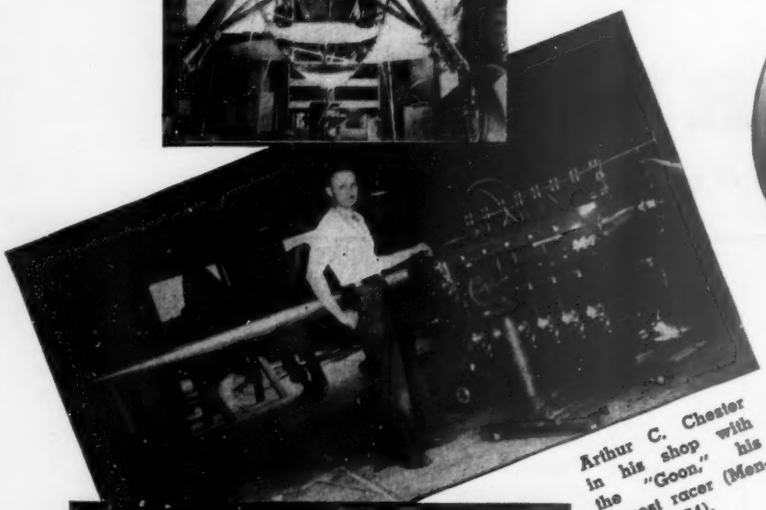
son is a veteran pilot who should get every ounce of speed out of his plane that the builder puts in. The first Folkerts racer, in the 375 cu. in. class, was an outstanding success in Los Angeles in 1936, its first time out. Then Folkerts built the Speed King for Rudy Kling, and this 544 cu. in. racer stole the show last year, winning both the Greve and Thompson Trophy races. With such a background we can't see ourselves betting any other way than for a continuation of the string of Folkerts victories. The newest Folkerts is reported as a counterpart of the two earliest designs, and is powered with a Menasco C6S4 engine of 544 cu. in. displacement. A high mid-wing cantilever monoplane with retractable landing gear, the Jacobson Folkerts racer is reported to have a shade more wing area than the Speed King, probably in order to provide for the increased fuel load to fly the Thompson distance.

Although the Schoenfeldt-Rider Firecracker could do no better than third in the Greve last year, we rate this plane no worse than second this year and consider it a very probable first place winner. This year the Firecracker will be flown by Tony LeVier, a comparative newcomer who proved himself at the Oakland races this May when he flew 150 miles around an 8⅓ mi. course at an average speed of 260.762 m.p.h., which is almost 4 m.p.h. better than Kling's winning time in the 1937 Thompson Trophy. Wm. Schoenfeldt and Tony



Retractable landing gear on Art Chester's "Goon."

Tony LeVier in the Schoenfeldt Firecracker.



Arthur C. Chester in his shop with the "Goon," his newest racer (Menasco C6S4).

Flap gear on the "Goon" showing pronounced up sweep of trailing edge of wing at fuselage.

Marcoux - Bromberg Jackrabbit Special, formerly the Elmendorf racer.

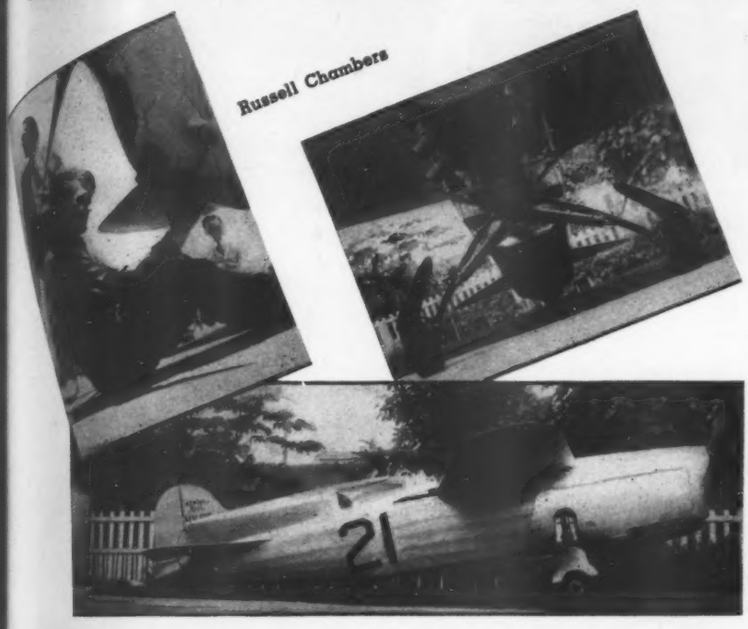
Keith Rider with the 8-Ball, built for the Union Airplane Company of Glendale, Calif.

Roger Don Rae takes off for the first flight of the 8-Ball.

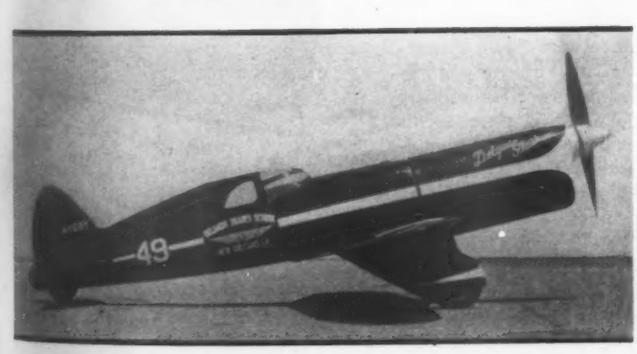
have completely revamped the Firecracker and have conducted a careful series of flight tests. Barring trouble, the plane looks like a cinch to fly the Greve distance at a speed of around 280 m.p.h. The Firecracker was originally built by Keith Rider in 1936. It is a low wing cantilever monoplane with retractable landing gear. An example of the thoroughness with which Schoenfeldt has prepared it is found in the fact that he has had a total of five propellers built and tested on the plane. To insure adequate cooling for the longer distances the plane is equipped with two oil coolers, one of skin type and the other a conventional cartridge type cooler. A by-pass protects the skin radiator from harmful pressures. Additional fuel capacity has been built in to provide ample supply for the Thompson Trophy distance. Schoenfeldt has also done a major job of revamping the Menasco engine but the changes made are confidential at this writing.

Right alongside the Schoenfeldt Firecracker at the finish line, and maybe in front of it and everybody

Marion McKeen of Los Angeles, pilot and owner of the revamped veteran "Miss Los Angeles".



A backyard racer, Russell Chambers' Chambermaid. Note landing gear, retracting vertically into wells in the fuselage. Above: Retractable leaf spring landing gear on Chambers' racer. The fixed fairings serve to close the wheel wells with gear in.

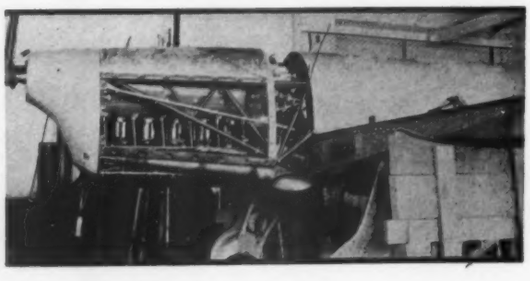


Delgado Flash designed by Byron Armstrong and built by Delgado Trades School, New Orleans.

Hydraulically retractable tail skid of the Crosby racer (a) with tail fairing cone removed and skid in extended position; (b) tail skid retracted up against the fuselage tail cone.

Crosby engine installation and exhaust manifold. Entire leading edge may be removed while servicing plane.

Crosby all-metal racer warming up for test flight.



Marcoux-Bromberg, showing new fairing tapering to fuselage from engine cowl. Stainless steel plate attached to wood fairing is protection against engine exhaust. Hot air outlet just above exhaust outlet exhausts air from a second oil cooler.

Tunnel under tail of Marcoux-Bromberg racer, for flowing air over oil cooler.

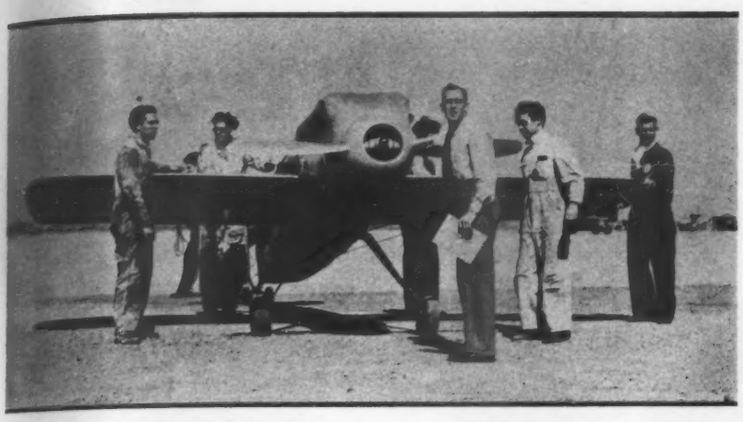
Nose of the Marcoux-Bromberg racer flown by Earl Ortman. Note carburetor air scoop below engine cowl, and oil cooler tunnel back under tail.

else, will be Keith Rider's newest racer, the 8-Ball. This plane was built by the Story-Gawley Company and is being raced by the Union Airplane Company of Glendale, Calif. No pilot has been named as yet, though Roger Don Rae has conducted the flight tests. The story is out that Rae will lose his flying job with TWA if he races this year. Rae won't say yes and he won't say no, but we guess he'll be at the controls come September 4th. This little plane is the prettiest Rider has built, and we don't know of a prettier ship under any other trademark. The Robin's-egg blue paint job is so slick that forty-eight thousand flies already are known to have broken their necks trying to "sit down" on it. It is significant to note that of the seven racing airplanes Rider has built, five will be at Cleveland. His first plane crashed at Chicago in 1930 with Major Macready, and the other missing member of the Rider family wound up in a ball against the home pylon with Rudy Kling at Los Angeles in 1936. All the Rider racers are of characteristic design arrangement, being sharply tapered low wing monoplanes with retractable landing gear. All have Menasco engines except the Twin-Wasp Jr. powered Marcoux racer, which was originally built by Rider. But the structural design of the Rider ships has run the gamut of accepted practise. His first job was all wood, his second, third and fourth all metal monocoque fuselages with two-spar wood wing, his fifth and sixth were steel tube fuselage jobs with monospar wood wings, and his new ship returns to the all wood structure with a monocoque fuselage, and a sharply tapered and swept back cantilever monospar monoplane wing.

The Rider 8-Ball has a span of 20 ft. 5 in., length of 19 ft., and total wing area of 75 sq. ft. Powered with a Menasco C6S4 engine, the gross weight is 1800 lbs. loaded. As with all the newer racers, it is fitted with split trailing edge flaps. Hydraulic brakes and hydraulic shock struts are fitted. The 8-Ball was test flown last May and has since been flown a number of times. Built by the Story-Gawley Co., leading propeller builders of the Pacific Coast, this plane seems favored from every angle. We wouldn't be surprised to see it clip the pylons for average speeds as high as 300 m.p.h. and don't see how anyone is going to stay in front of it without bearing down hard on the throttle.

Fourth plane for Greve mention is Chester's Goon but this plane really rates equal billing with the three previously discussed. We honestly think that the Greve will be a dogfight among these first four, with the others trailing rather definitely. We could write a book about the new Goon and the vicissitudes through which Art Chester has gone in creating her—if only space permitted. With Art's well proved ability as a designer, builder, mechanic and pilot we may well expect the Goon to be an unusually

Roscoe Turner's Twin Wasp Meteor



S. J. Wittman with his Curtiss D-12 powered Thompson Trophy racer Bonzo.

successful plane. By all standards of measurement the Jeep, its predecessor, has been just that and we dope the Goon to carry on the tradition. Art has reversed the direction of rotation of his Menasco C6S4 engine in order to mount a French two pitch position Ratier propeller similar to the one used by Detroyat in 1936. By running his engine backward Art hopes to get farther forward. His work in obtaining the French propeller has been heart breaking as he was apparently opposed by the entire French Air Ministry. Permission was finally obtained, however, and the propeller is, at this time, supposed to be in this country in the hands of American Railway Express. Upon delivery of the prop Art will proceed with his test flights and we expect to see the Goon in nice shape at Cleveland. She incorporates a host of novel and excellent features. Of course the two pitch propeller, with pitch shifting automatically from low to high at 100 m.p.h. air speed, is the major feature of the plane. This should get the Goon off the ground ahead of all competition, and may serve to keep her ahead once in the air.

Art is using a unique wing, with symmetrical airfoil section tapering in thickness from 10 per cent chord depth at the root to 6 per cent at the tip. The wing tapers from 60 to 45 in. in plan form. Of two spar wood construction, all plywood covered, the airfoil has been twisted at the root and tip so as to give a zero angle of incidence at those points while the maximum incidence of 2½ degrees is reached at a point 20 in. outboard from the fuselage. The airplane is a true midwing. Landing gear is fully retractable into the fuselage, hydraulically, and the tail skid also retracts. The entire airplane is as clean as a whistle and special attention has been given to the engine cowling, both as to clean lines and efficient cooling. With a span of 18 ft. 6 in. and a length of 21 ft. 4 in., the Goon has a wing area of 66 sq. ft. effective, and a gross weight of 1680 lbs.

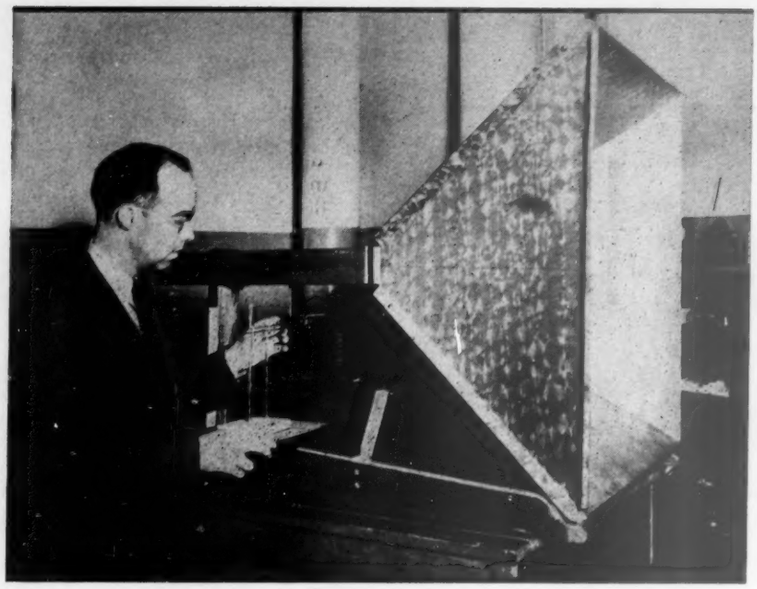
The ill fated Elmendorf Special, which so far has brought its owner and pilot Dave nothing but a headache, is slated to do a swift comeback from the crash landing last May at Oakland which might have relegated it to the junk heap. A Rider design, the Elmendorf Special is now the property of Hal Marcoux, who will race her as the Jackrabbit Special. Marcoux's trusty henchmen, Jack Bromberg and F. J. Roberts, have supervised a complete rebuild job on the Jackrabbit Special and it should show at Cleveland the same smooth running reliability that has characterized the big Marcoux-Bromberg racer for the past two years. The work that has been done on the Jackrabbit has been aimed at reliability rather than speed so we shall expect to see this plane right in there flying after some of the others in the race have retired. We don't see how the Jackrabbit can get in front of the fastest

(*Turn to page 77*)

C. R. Pearson and Lee Williams, of the Pearson-Williams Airplane Co. which built Mr. Smoothie.

Shop view of Mr. Smoothie.

L. to R.—Herb Shearer, West Coast Chairman Professional Race Pilots Ass'n. Lee Williams—Pilot. Mrs. Edith Boydston Clark—Owner. C. R. Pearson—Co-Designer, with Mr. Smoothie.



Dr. W. L. Barrow and horn

3 SPOTS and a HORN

By Donald G. Fink
Radio Editor

A preliminary account of the BAC-MIT Blind Landing System based on Irving Metcalf's "three-light" method.

THE LANDING OF AIRCRAFT BY INSTRUMENTS is an art which has been marked by a great deal of "development" and by very few new ideas. Nearly all blind-landing systems which have come into prominence during the past five years are based on the original work of the Bureau of Standards. These systems depend on a glide path which is nothing more than a locus of constant signal strength, formed by the mutual interference of a directly radiated radio wave with a wave reflected from the earth. Three criticisms have been directed at this method: first, the locus of constant signal strength so formed is not a straight line. As a result the attitude of the ship must change during landing, or the equivalent effect obtained by throttle control. Neither procedure appeals to pilots; they want a straight glide path which permits of a constant attitude of approach throughout the landing. The curvature of the path, moreover, brings the line of flight parallel to the ground in the last part of the landing, making it more difficult to clear obstacles on or near the field. In the second place, the vertical position and shape of the glide path depend on the reflecting properties of the earth. Snow on the airport can cause a considerable vertical shift of the glide path, and the edge of a steel-reinforced concrete run-way can introduce a sharp "hump" in the path. Thirdly, the indication of the glide path depends upon the constancy of the receiver sensitivity. Any change in this sensitivity will produce an entirely fictitious change in the apparent vertical position of the glide path. That these problems are not insurmountable has been proved by the intensive development of the system by such organizations as Washington Institute of Technology, Lorenz A. G. of Berlin, and United Airlines-Bendix. It cannot be denied, however, that these difficulties have been the principal bar to acceptance of blind landing in commercial flying.

Some two years ago there was projected into the picture a brand-new idea, conceived in the mind of Irving Metcalf, of the Bureau of Air Commerce, a man thoroughly conversant with the vagaries of the older system. The idea, the "three-light" system, was so new that there was no equipment available for testing it, so "Met" set out to find an organization capable of developing it in practical form. He found the organization in the Department of Electrical Engineering at M.I.T., in the Communications Division headed by Prof. Edward L. Bowles, under whose general direction the project has been carried forward. The Communications Division has been noted for a very catholic taste in research projects, having spent much time with fog-dissipation, and similar projects of importance to aviation. Professor Charles S. Draper of the Aeronautics Department of M.I.T. has cooperated in the instrumentation aspect of the project.

The Metcalf ideas looked good to M.I.T. Likewise they looked good to the Bureau of Air Commerce, who underwrote a contract for a 12-months' program to be carried out in the M.I.T. laboratories at Cambridge. At the end of that period, in June 1938, the work had progressed to the point where an extension of an additional 15 months was found justified by the Bureau, and the wherewithal assured.

At the present writing, the Metcalf-M.I.T. system of blind-landing has not yet been flown in an airplane. It is, in other words, still very much in the experimental stage. But it shows such promise that many interested parties, including the Army, one or two of the major airlines, and several important companies in the aircraft-instrument and communication-equipment fields, have beaten a path to Cambridge to watch the new "mouse-trap" catch mice on an experimental basis.

Recently your radio editor visited Cambridge to gain at first hand some idea of the principles involved in the new system. In the course of a full eight-hour day, he was kept busy digesting the answers to all the questions he could think of.

The Metcalf Three-Light System

The original idea harks back to the theorem in plane geometry which states that three points determine a

Irving Metcalf

plane. The plane in this case is a "landing reference plane" inclined to the surface of the airport, as shown in the accompanying diagram. Metcalf reasoned that if three definite points in this plane could be in some way made "visible" to the pilot at all times, regardless of actual visibility conditions, the pilot could perform a landing in relation to these three points alone. The idea may be visualized by imagining three extremely powerful light beacons, one on the surface of the airport, the other two suspended on either side of the runway, and visible to the pilot under all conditions. It requires very little mental coordination to visualize the plane passing through these three lights, and to visualize the landing path of the ship as a line contained in this plane. With the help of this visualization, the pilot can land if the three points are visible regardless of the visibility of other points on or above the airport surface.

At first glance the idea appears attractive, but highly impractical. The visibility question cannot be solved by light beacons, as experience with fog has proved. But Metcalf reasoned that if three transmitters, utilizing radio or some other type of radiation beam, were set up on the airport, and if the direction from the airplane to each of these transmitters could be determined by directional receivers, then the apparent position of the transmitters might be indicated to the pilot simultaneously, on a screen mounted on the instrument panel. Highly accurate direction finding would be the first requirement, and some means of transferring the indicated directions into "apparent positions" was the second.

One of the possibilities of approach to the problem of accurate direction finding involves signals which fall out of the radio classification entirely, i.e., infra-red rays. Infra-red has been a magic word for many years: the physicists will have none of it because "scattering" of infra-red in heavy fog can be calculated quite easily, and the calculations lead to the conclusion that the penetration is limited to a few yards under "thick" conditions. The calculations had not been subjected thoroughly to experimental verification, however. One of the incidental aspects of the job, therefore, was a painstaking test of the infra-red idea. At the Round Hill Experiment Station in South Dartmouth, where the fog-dissipation work has been in progress, careful measurements were made of infra-red penetration through fog. The conclusion was unmistakable: despite its applications elsewhere, infra-red cannot be counted upon for direction finding in blind landings, not at least under the conditions visualized by the M.I.T. group.

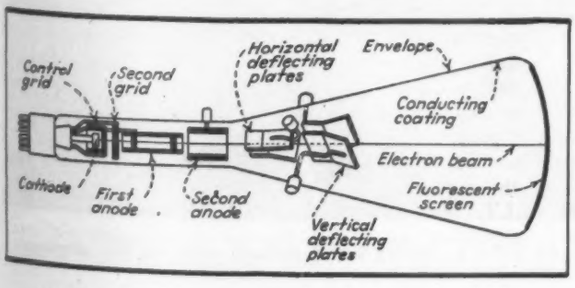
This conclusion gave full impetus to developing a radio system which would not have the limitations encountered by previous workers.

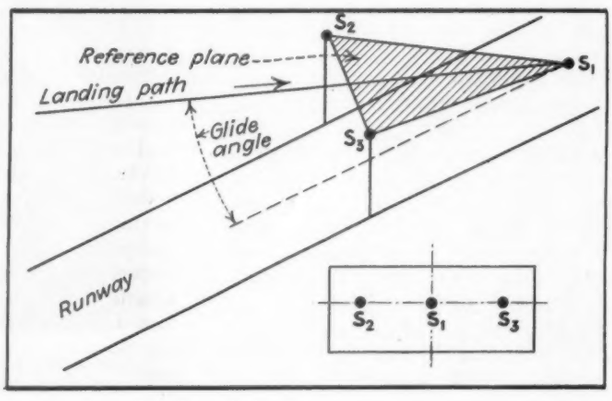
Fortunately, a new method of the propagation of extremely short radio waves had already been announced, when Metcalf asked the Institute to develop his ideas. The new radio technique was discovered by Dr. W. L. Barrow of M.I.T., who found that radio waves, preferably those shorter than one meter in length, can be propagated into space from the mouths of horns, in much the same manner as can waves of sound. The theory of the subject, as developed by Dr. Barrow for application to the blind-landing system, indicates that extremely narrow beams of these short waves can be generated by the use of suitably-shaped horn structures. Moreover, by employing a horn of rectangular cross-section, with a width considerably greater than its height, a fan-shaped beam having a height considerably greater than its width can be produced. By overlapping two such beams along their flat faces, the region of overlap establishes directivity in the horizontal direction, but not in the vertical direction.

Conversely, a horn having a high, narrow cross section will produce a broad flat beam, and two such horns can be used to create overlapping beams suitable for establishing directivity in the vertical, but not horizontal, plane. By these means beams may be projected into space independent of the ground, since the projection depends only on reflections from the horn surfaces, and upon diffraction effects at the horn edges. Consequently, the beams are extremely stable with respect to changes in ground conditions. Further, when two beams are made to overlap one another, the region of overlap is straight. Consequently, when such a region of overlap is used for the landing path of

(*Turn to page 73*)

Below: Elements of Cathode-ray Indicator. Left: Geometry of three-spot system. Inset: Appearance of spots when on landing path.





SEEING

is Believing

Visual instruction methods at the Boeing School of Aeronautics

By Allan F. Bonnalie,
Director of Technical Instruction

B. C. Haynes, head of the meteorology department, has developed these visual aids for air mass analysis instruction.

AVIATION IS NOT YET AN EXACT SCIENCE, in any of its branches. Much of our design work must still be based on empirical formulas. We know so little of such a fundamentally important thing as air flow that we must devote thousands of hours to testing models, and even full size planes, with the aid of complex recording instruments, smoke streams, etc. Because of this general condition it has been difficult to perfect a satisfactory classroom technique in teaching aviation theory.

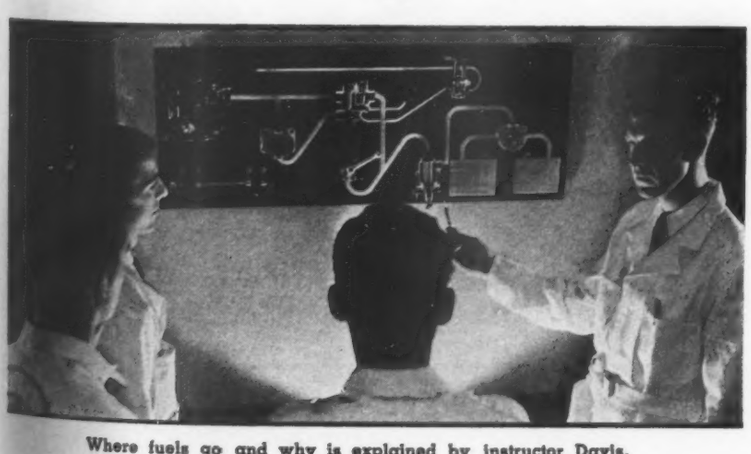
Many seekers after aviation truths are mentally "in the clouds" due to the newness and "romance" of aviation. For such students it is doubly important that we find ways of bringing the aviation "facts of life" squarely before them. This need to clarify the presentation of aviation knowledge has forced us to develop, at the Boeing School of Aeronautics, a program of visual education that plays a big part in all of our teaching activities. So satisfactory has this teaching tool proved that we have carried it to a high state of perfection, probably farther than any educational institution of any kind has developed similar methods. And we are convinced that the visual way of teaching, based on our experience with it, is due for much wider development. To explain in a paragraph the fundamental method of visual instruction as we have applied it we may illustrate by our approach to teaching meteorology. The accepted way of teaching meteorology has been to supply the student with a good text-book, usually well illustrated with pictures of clouds. After he had read the book, or part of it, and looked at cloud pictures, the instructor took the class on field trips to look for actual clouds, and to explain their relation to various atmospheric phenomena. But at about that point the instruction ended. For a really comprehensive knowledge of cloud formations and their significance

Taking a leaf from the N.A.C.A., Boeing School students study air flow phenomena by projecting test section of a smoke tunnel on a large screen.

The behavior of relays in radio circuits can be studied more easily if the equipment and the circuits are spread out for inspection.

Apparatus for studying action of cams and cam followers.

Intricacies of the Sperry automatic pilot in simplified mockup.



Where fuels go and why is explained by instructor Davis.

it was necessary for the student to await the passage of sufficient time for him to personally observe various conditions of clouds in action.

In our meteorology classes, under the direction of B. C. Haynes, we supplement book work and personal observation of local weather conditions with showing of moving pictures illustrating widely varying weather conditions along the entire transcontinental airway between San Francisco and New York. Then we add to this instruction demonstrations with three-dimensional models of "weather fronts," cloud layers, the Bjerknes cyclone model, etc. These cloud and air current models show the students the actual depth of air layers, their respective temperatures, directions and velocities, and the attending phenomena. They are able to see clouds from above as well as from below, and not only to see them but actually handle them. This extension of "visual" education to the point where the students actually touch and feel the three-dimensional model that is being used to visualize their lesson for them is one phase of teaching which is proving invaluable.

Another aid to meteorological instruction is a "dynamic" model we have developed to illustrate what happens when air masses of varying temperatures and densities mix. For this purpose we use a plate glass water channel in which a thin sheet aluminum dam keeps the channel divided into two compartments until we are ready to start a "storm" for the class. By using blue or red ink to color the different bodies of water, we are able to see what happens when the dam is removed. To simulate varying air mass densities we use salt stirred in to produce the desired condition. Thus when the dam is removed the salt loaded water will act in much the same manner as a "cold front" in an air mass movement. This movement can be seen due to the different colors of the two bodies of water. The effect produced is highly educational. Also, by using a hot spot under a portion of the water channel we can produce rising currents of warm water to simulate the rising currents of heated air which produce cumulous clouds in the atmosphere.

This method of visualizing lessons for the students not only speeds the educational process, but actually explains certain things that could never be taught properly in any other way. This is particularly true of such problems as teaching complex mechanical linkages; a subject to which no book can do justice. But by means of models, sometimes made by the students themselves, and always freely handled by classes receiving such instruction, every phase of each movement is clearly inscribed on the mind of the student. Thus we improve on the old Chinese proverb to the effect

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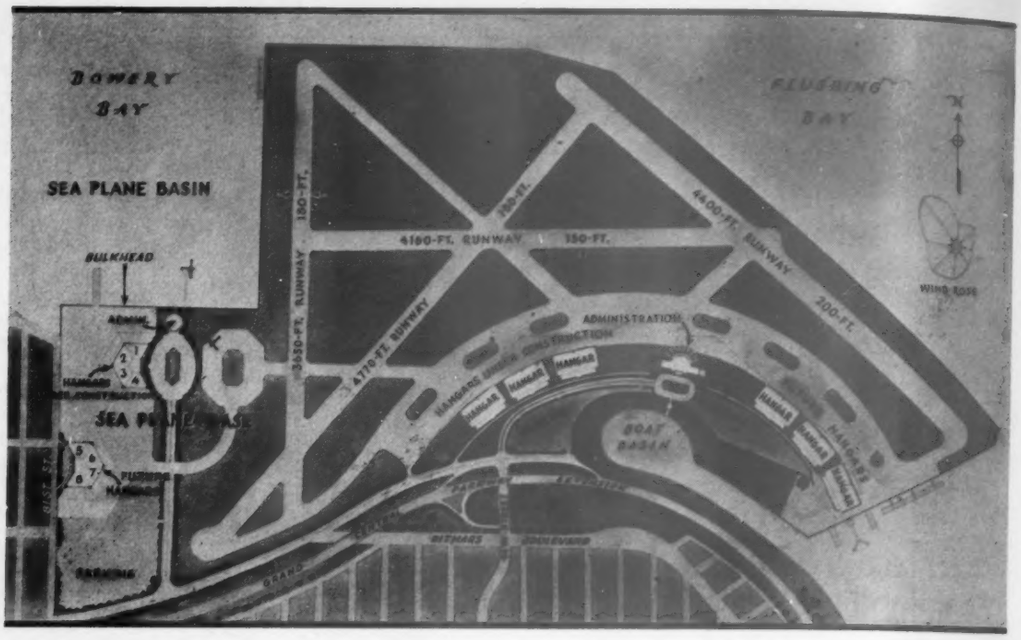


At the Fair's Front

New York Rushes work on a $22,000,000 Trans-Atlantic, Trans-Continental Airport at North Beach—two miles from the Fair Grounds, 25 minutes from mid-town.

By Daniel Sayre
Associate Editor AVIATION

MAYOR FIORELLO (QB) LAGUARDIA's City of New York seems nearing the end of a long, long search for an airport. For 30 years, names like Morris Park, Brighton Beach, Governor's Island, Hempstead, Mineola, Hadley, Hasbrouke Heights, Valley Stream, Newark and Floyd Bennett Field have backgrounded rich, colorful chapters in the city's flying life. Just reciting the list makes metropolitan pilots weep sentimentally into their beers. But not one name among them brings up a picture of the big, well-equipped, centrally-located terminal air transport should have as a doorway to the World's largest city.

But it won't be long now. Sometime next April or May, probably within a few days of the opening of New York's World's Fair, the WPA and the N. Y. Department of Docks will unveil, or cut the tape (or whatever it is one does to open new airfields) on the North Beach Municipal Airport. And while there are still some formalities to be cleaned up, we're betting our money that within a period of a few months thereafter all air lines serving the New York area will be forgetting they ever put up with any other New York Base.

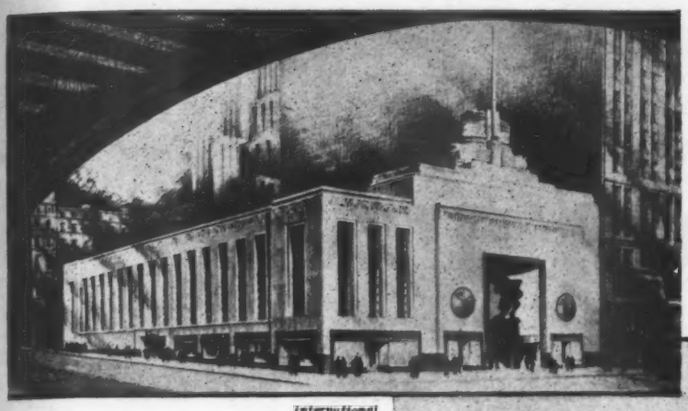
First of all, North Beach is so well located the lines would be justified in using it next year even if it were a cow pasture. A bare two miles up a wide parkway drive is the World's Fair grounds. Through North Beach the air lines will therefore be able to put its passengers closer to the lodestone of the country's millions than any other travel agency but the bus and the subway. In fact the port will

Landplane hangars will be 350 ft. by 184 ft. Doors are 165 ft. long, 40 ft. high. The seaplane hangar will have one door clearance of 204 ft.

serve so well as a full scale exhibit to the Fair crowds, its our particular lunch that air line money spent for exhibits within the Fair grounds will be just a leetul wasted. Even more importantly, a car leaving the airport can speed into town along the above-mentioned parkway, cross the Triboro Bridge, then slip down the new East Side Highway (which should be finished by next year) and be in the mid-town section of Manhattan in less than 25 minutes. That's a half hour better than limousine-time to either Newark or Floyd Bennett.

Second, the new North Beach field is going to be big—or big enough anyhow. Last year when the city bought up the old Glenn Curtiss airport, the first thing it got the WPA to do was pull down a nearby hill. Then it lowered the old 135 acre field, built a long trestle over to nearby Ricker's Island and started hauling 10,000,000 cu.yds. of fill to make the new field 432 acres in area. (Floyd Bennett is 400 acres). Critics have sprung up to claim the field will never be adequate for transport use but last month a committee for the domestic lines including flight superintendents, chief pilots and engineers spent two hours dragging the field from all conceivable directions. When they had finished their survey, it was "unanimously agreed that North Beach when completed as planned would be an excellent airport". The committee asked for one runway to be stretched to 6,000 ft., for the installation of the latest thing in lighting and for various obstacles to be clearly marked. But the next day several members of the same group told a Newark official in no uncertain terms a half dozen things they thought were wrong with Newark. There will still be the permission of the Post Office to get for the transfer, probably Newark will never be entirely abandoned, and the lines haven't quite signed papers yet. . . . But they'll be there.

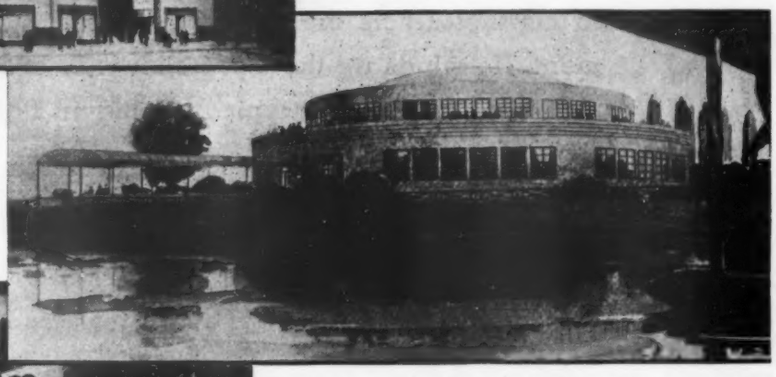
And is North Beach going to be well equipped? Well, there's $22,000,000 worth of taxpayers' money going into it just to finish the field and runway, build administration buildings for both land and seaplane operations, and complete three big land plane hangars and one colossal building to house the trans-Atlantic giants of Pan American, Imperial, Deutsche Lufthansa, Air France and—who knows else?



International

Proposed three story inter-line air terminal at 42nd and Park Avenue.

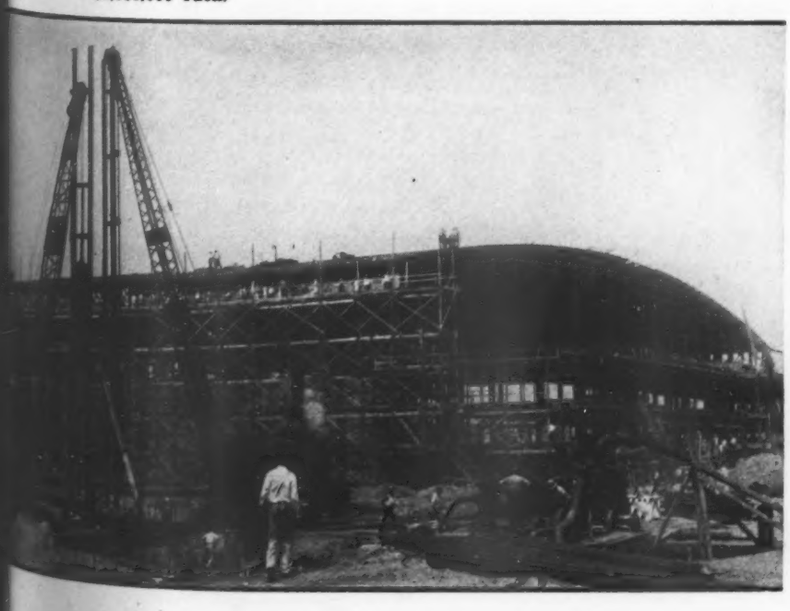
Door

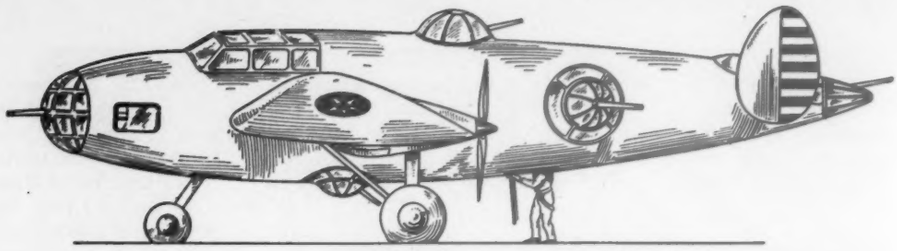


North Beach's Seaplane traffic building will look like this and cost $545,000.

Brickwork is already finished on one of the big landplane hangars. Foundations are going in for two more. Cost: $1,000,000 each.

The building used by land plane passengers will be even bigger and cost $1,047,000.





AIRCRAFT ARMAMENT

In his first article the author described modern aircraft armament. He winds up the discussion with a detailed study of the gun installations in a typical multi-gun fighter

NO MATTER HOW EFFICIENTLY an airplane is armed, the effective use of the armament depends in a large measure upon its installation; this is especially true of the gun mountings. The problem of mounting guns in airplanes presents many difficulties for, besides the mechanical problems of gun forces, sighting, operation and ballistics there is also the aerodynamic problems of protruding gun barrels, effect of gun forces on stability, flight path, wind velocities and projectile deflections due to slipstream when firing broadside.

The large, high-powered combat plane does not offer as many complications as the single place or dual place plane when large guns are used. In the combat plane, the guns can be placed about the ship in such a manner that a sufficient concentration of fire (3 to 6 guns) can be directed at one spot and there is ample room for operating the guns by mechanical means. (A suggested arrangement for maximum protection is sketched above) The most formidable positions for gun placement are in the nose and tail where a clear field of fire, and a large view for the gunner can be obtained. These positions are excellent for both offensive and defensive tactics. A nose turret (A) provides the best position for attacking opposing airplane from the rear and side while offering protection against attack from front. The tail position (E) is excellent for laying a curtain of fire to the rear for both offense and defense.

A cannon similar to the Type F. previously described (Aviation, July 1938, p. 22) when placed in a ball turret can be made to cover fully three-quarters of the front hemisphere. The spherical turret mounted to turn freely about a vertical and horizontal axis is capable of such operation. In the turret shown in (A) the gun is rigidly mounted in the ball as is the gunner's seat and sight. The turret is rotated by mechanical means and controlled by a stick, operated by the gunner. The gun is fired by means of a pistol grip on the control stick or a foot pedal. No manual

Field of Fire Charts for the multi-gun fighter suggested above

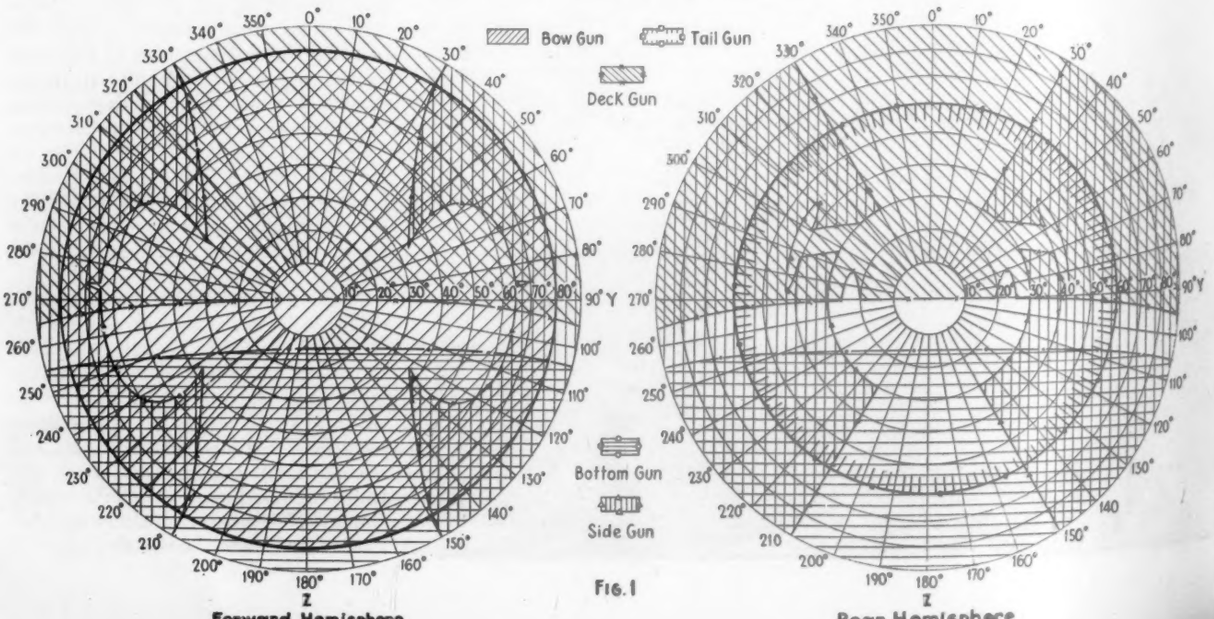


FIG. 1

Part II

By Horace J. Alter

handling of the gun can be attempted since the wind forces on the barrel at speeds of 250 m.p.h. or over preclude efficient operation by hand. With mechanical means at his disposal, and with his seat and sights fixed relative to the gun, the gunner can follow his target around. He can sight his gun on an objective and lay down an effective barrage of explosive shells by "flying" his turret on the path of the enemy airplane. Thus, although he is in a sense "flying" the turret as a pursuit pilot flies a single place airplane i.e. on the target, the actual plane is flying and maneuvering independently or in a formation. In fact, he has all the maneuverability of a small pursuit and at the same time a steady firing platform. Furthermore, while the recoil of a heavy cannon may be a serious handicap to the small plane, in a plane of this size and power it is not of serious consequence. Assuming the plane to have 2,000 h.p. for level flight the gun will have a slight negative horsepower and exerts a recoil pull of 1,700 lb. producing a slight deceleration. Calculations have shown that the firing of large guns has very little effect on the control and maneuverability of the plane.

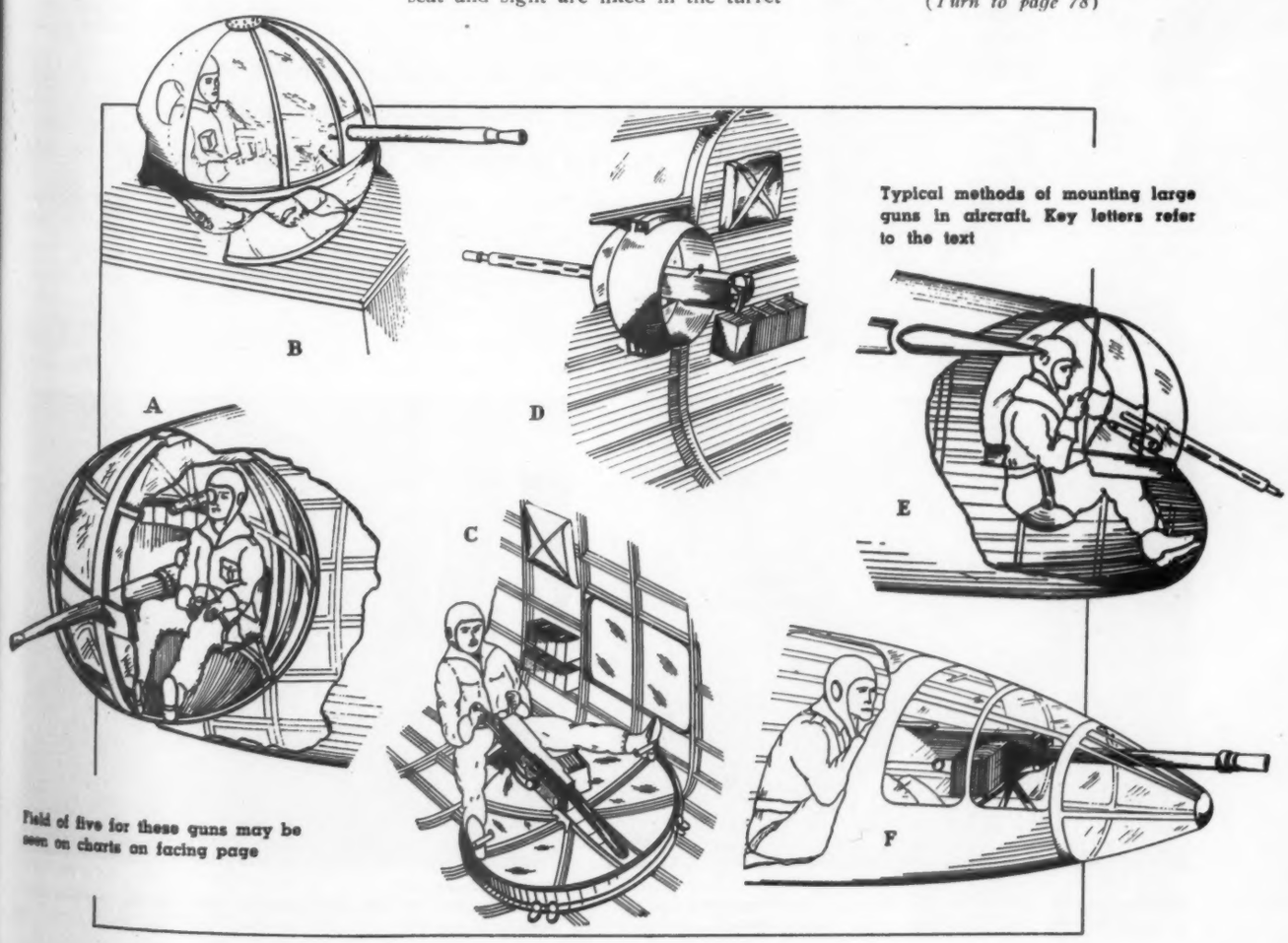
The bottom and tail of the airplane has always been the "Achille's Heel" and is subject to the most devastating fire. The rear gun is necessary for a defensive as well as offensive position. The dimension of the tail portion of the airplane does not permit the use of a large gun and the necessary heavy mount. A 30 or 50 cal. machine gun seems to be the optimum installation. Manual control should not be difficult since the neighboring tail surfaces tend to screen this position.

(B) shows a fighting deck just above and to the rear of the wing consisting of a spherical turret in which is mounted a gun similar to the type M or Madsen 23 mm. In this turret also, the gun, gunner's seat and sight are fixed in the turret which can be rotated in a manner similar to the nose turret. Just forward of this turret is a fire control and bombing operations station. The top and rear gun turrets cover the entire hemisphere above horizontal.

The side guns, mounted fore and aft are small calibre machine guns which give adequate defensive fire and great concentration of fire to the side for close ranges. It can be seen, that a "broadside" from a ship of this type consisting of a 37 mm cannon (with explosive shell) two side guns of 30 or 50 cal. and an upper gun of 23 mm. (with explosive shell) will lay a barrage of fire that will literally blow the opposing airplane out of the sky.

For speeds of 250 to 350 m.p.h., the only maneuver in which the relative velocity of the two planes is at a minimum is that in which the airplanes are flying parallel or nearly so. It follows, that in such position, the gunner will have a longer period of aimed fire, smaller angular velocities to correct for and a larger target. Therefore, an attack position slightly forward and parallel to the

(*Turn to page 78*)



Typical methods of mounting large guns in aircraft. Key letters refer to the text

Field of fire for these guns may be seen on charts on facing page

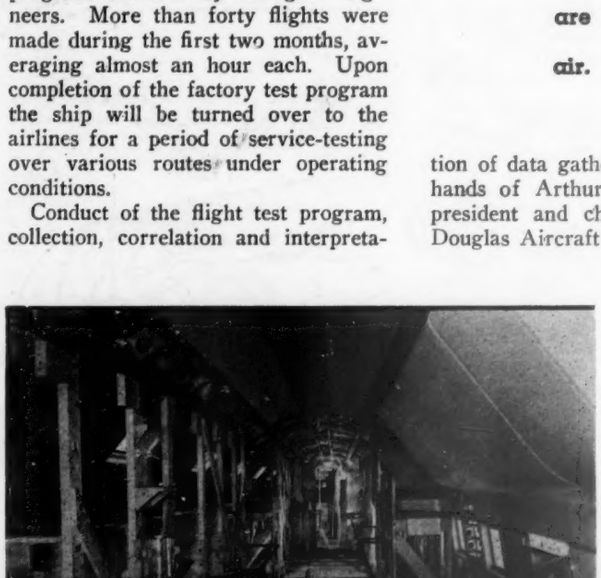
THE FIRST 100 HOURS

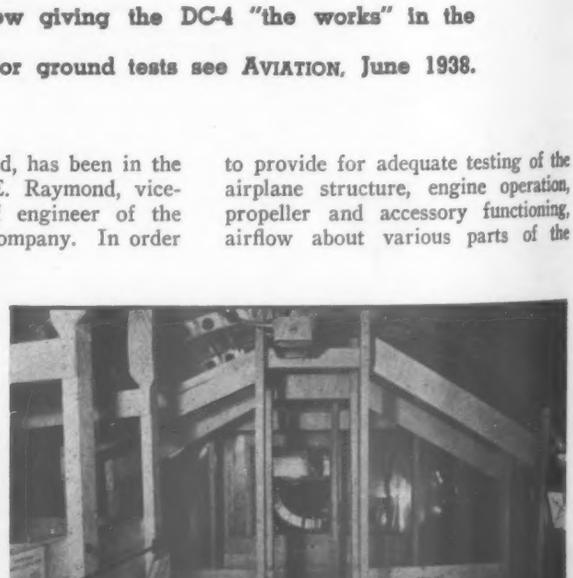
Are the Hardest!

Carl Cover and a corps of Douglas technicians are now giving the DC-4 "the works" in the air. For ground tests see AVIATION, June 1938.

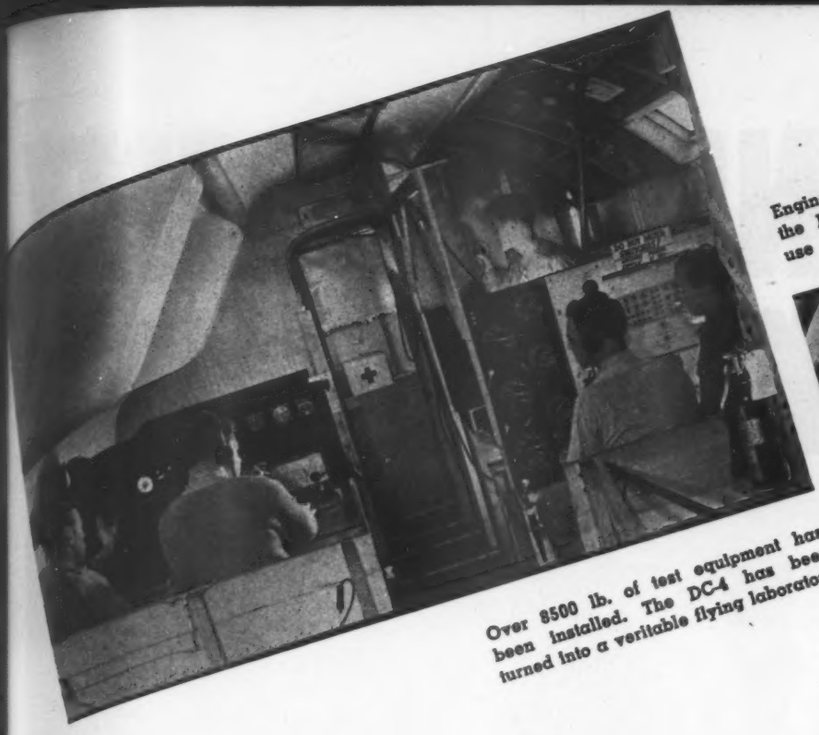
IN EARLY AUGUST, after two months of flight testing, the Douglas DC-4, faced another eight weeks of factory flight testing to complete the rigorous program outlined by Douglas engineers. More than forty flights were made during the first two months, averaging almost an hour each. Upon completion of the factory test program the ship will be turned over to the airlines for a period of service-testing over various routes under operating conditions.

Conduct of the flight test program, collection, correlation and interpretation of data gathered, has been in the hands of Arthur E. Raymond, vice-president and chief engineer of the Douglas Aircraft Company. In order to provide for adequate testing of the airplane structure, engine operation, propeller and accessory functioning, airflow about various parts of the





Douglas engineers took no chances on having test loads or test personnel shift about in flight. The heavy timbers anchored down the tons of pig lead used to simulate the possible load conditions.



Over 8500 lb. of test equipment has been installed. The DC-4 has been turned into a veritable flying laboratory

Engineers at work on board the DC-4 in test flights. Note use of inter-communication sets

plane, etc., it was necessary to install equipment weighing 8,424 lb., nearly twice the normal payload of a modern airliner. As many as 22 engineers and observers, in addition to the pilots, have gone up at one time in the DC-4 to check and record readings of the various instruments.

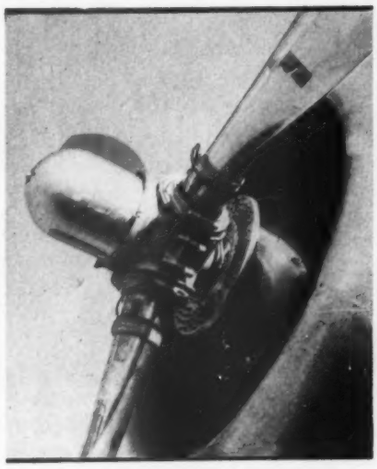
Of the more than forty flights to date the first few were devoted to control adjustments. Thereafter Mr. Raymond's corps of technicians began to tackle bigger problems. Engine temperatures, on the ground and in the air; fuel consumption under varying conditions; vibrations in single components of the plane, in whole groups, and in the propellers; load distributions; airflow characteristics in different attitudes, speeds and operating conditions; and a hundred and one other important matters were all checked with a thoroughness and an accuracy never before possible during actual flight. Engine temperatures and pressures, for example, required blanks for 110 separate lines of data, each carefully filled out during flight.

Engineering charts were prepared prior to each flight to show the program to be conducted. These were so complete that on them was indicated the exact position in the plane of every instrument and every observer.

Observers sat on comfortable benches in front of large desks on and over which an astounding array of instruments and controls was arranged. Engine performance, air, fuel and oil pressures, the electrical system, the hydraulic system, vibrations and deflections of structures, all were checked and double checked. Up in the cockpit Al Reed, test flight engineer, watched the dials and gauges on the instrument boards and dictated his observations into a recording machine, to be transcribed by a stenographer on the ground. By means of a complete inter-phone system Reed was able to communicate constantly with the pilots and with the engineers throughout the plane.

The DC-4 has become a familiar sight in the sky above Los Angeles, and she daily enhances her reputation for reliability and tractability with airport observers and others who have had the opportunity of watching her. Pilots who have flown her remark on the ease of control and stability.

When the tests are completed the heavy timber racks which now hold the pig lead bars of ballast in place, and which support the desks and benches on which is mounted the testing equipment—will be removed and the interior fittings, curtains, reading lamps, berths, lounges, pantry, kitchen, and all the rest of the equipment will be installed.



For studying vibration of engines and propellers a pick-up device was mounted on the propeller hubs (below) connected to instruments (above) in the cabin laboratory. Vibration patterns were recorded on continuous film for later study.

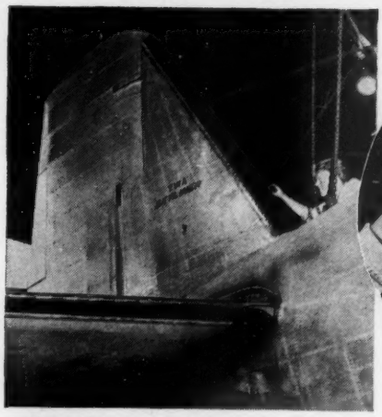
FOR LANDING SAFETY TWA SKYLINERS ARE

READ WHAT MR. JACK FRYE, PRESIDENT OF TWA, SAYS:

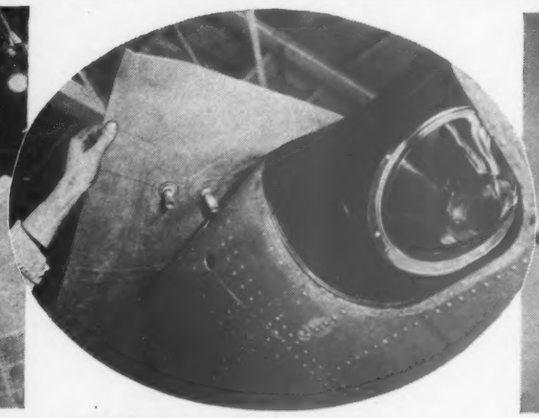
"TWA has always been a user of Goodrich Silvertown Airplane Tires and Goodrich Airplane DE-ICER equipment, as well as other Goodrich products designed to make commercial transports safer in the air and on the ground. Our experience with Goodrich has been most satisfactory. In addition to building products of top-notch quality the Goodrich organization is also to be congratulated for its progress in scientific research which is playing such an important part in the safety of aviation today."

(Signed) Jack Frye, President
Transcontinental & Western Air, Inc.

TWA PROTECTS PLANES AGAINST ICE FROM TAIL TO NOSE...



TAIL SURFACES. The Goodrich DE-ICER safeguards leading edges where ice may collect. Even the stabilizers and fins of TWA planes, as shown above, are protected at every vital point. Ice gets no foothold here.



WING EDGES. A typical installation of the Goodrich DE-ICER on the leading edge of a wing. Note the tubes through which the DE-ICER "shoes" are automatically inflated and deflated, thus loosening and lifting ice so that the wind can sweep the wing edge clear.

PROPELLERS. Ice finds no welcome on TWA propellers. That's because a special "spinner" and "slinger ring" assembly developed by Goodrich constantly bathes propeller blades with a solution that defies ice formation.

AND FLYING SAFETY GOODRICH-EQUIPPED

Year In and Year Out "The Lindbergh Line" Picks Goodrich Tires, DE-ICERS For *Extra Safety* In the Air . . . On the Ground! . . .

Since its earliest days TWA and Goodrich have been constant "flying companions." As TWA took shape . . . progressed . . . grew to one of the world's foremost air lines, Goodrich was chosen time after time for bigger, faster planes and new services. And today the thousands who "fly TWA" not only have safer, smoother landings on Goodrich Low Pressure Tires but the protection of the famous Goodrich DE-ICER during winter and high altitude flying.

It's the ability of Goodrich Aviation Products to give greater safety that has made them the worldwide choice of leading pilots, plane makers and air lines. If you are interested in greater safety and efficiency for your planes you'll be interested in the complete story about more than 40 Goodrich Aviation Products—everything from Goodrich Airplane Silvertowns, DE-ICERS and the NEW Goodrich E. T.* Airplane Brakes to the tiniest grommets made. Write Dept. 666, Aeronautical Division of The B. F. Goodrich Co., Akron, Ohio, for a copy of "Goodrich In Aviation."

**Expander Tube*

15 HRS. 13 MIN. ACROSS SCENIC AMERICA! TWA prides itself on fast, convenient schedules, luxurious travel every mile of the way. And TWA treats passengers to unforgettable views of the colorful southwest —Grand Canyon . . . Boulder Dam . . . Meteor Crater . . . Painted Desert . . . all seen from the air aboard planes that are *Goodrich-equipped for safety.*

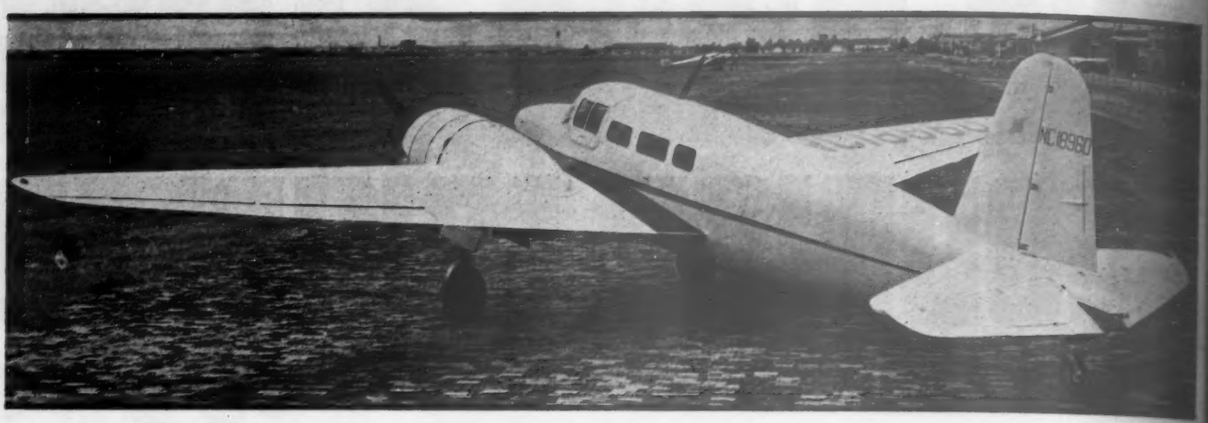
FROM STANDSTILL TO 60 MILES AN HOUR IN THE WINK OF AN EYE!

A TWA giant swings low for landing! Down go the wheels! Up comes the ground at 60 miles an hour! And these huge Goodrich Airplane Silvertowns that were at rest barely a second ago are whipped to whirlwind speed! Yet 12 tons of metal are safely "cushioned" to a smooth, gentle landing — an ordinary routine job for the many Goodrich Airplane Silvertowns used on TWA landings night and day!

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes — including Tires — Tail Wheels — Abrasion Shoes — DE-ICERS — Matting — Rubber Hose — Grommets — Shock Absorber Cord — A Complete Line of Rubber Aeronautical Accessories.



PLYWOOD Airplane

Bennett Aircraft, Inc. of Dallas introduces twin-Jacobs powered ship of all-wood construction

OUT IN LOS ANGELES several months ago we stopped in at a hangar on Van Nuys Airport to admire a ship that Vance Breese was then test flying, the Bennett Bi-motor. With justifiable pride Art Mankey, Bennett's chief engineer, pointed out its features, particularly the high surface polish and true contours that were made possible by the use of all-plywood balloon-cloth-covered construction. In this respect the Bennett Executive is different from other light transports now on the American market. Our designers have, in the past few years, generally thrown their lot with all-metal structures. Latterly, however, some suspicion has been aroused that wood still shows possibilities for certain izes, and Mankey is in the front rank of those to translate that suspicion into conviction, full scale. Actually, the ship seemed as beautifully finished as many of the high performance sailplanes familiar to visitors at Elmira. The fact that we met Hawley Bowlus at work on the Bennett may have had some significance.

Conventional Fuselage

The fuselage construction is conventional, with a skeleton of built-up frames and routed stringers, and a smooth Bakelite plywood skin secured by glue. The wing structure departs from the conventional, as a single spruce combination box and I spar is used to carry the loads. Spruce ribs and Bakelite plywood comprise the rest of the wing structure. Bakelite plywood covered ailerons are of spruce, with a trim tab mounted on the right aileron only. Split type flaps, extending inward to the fuselage, duplicate the aileron construction. Tail construction matches other parts of the ship.

The hydraulic retractable landing gear is the simple single fork type. In the wheel-up position the gear swings backward into the nacelle and lies flush with the lower line of the nacelle. Oildraulic shock absorbers with eight inch travel, Goodyear wheels and hydraulic brakes, are used.

Arrangements for seven passengers and one pilot are provided in the cabin. Access to the cabin is gained by two doors on the port side. One leads to the forward, or flight compartment and the other to the rear compartment. Both doors latch at the bottom and open upward, then hinge at their lateral centerline to lie back on the top of the cabin.

Flying Equipment

General Discription

(Data and performance figures as supplied by manufacturer.)

Span	48'2"
Length	30'6"
Height	9'5"
Wing Area	302 sq. ft.
Gross Weight	6,908 lb.
Useful Load	2,392 lb.
Maximum Pay Load (based on Department of Commerce regulations. Includes all load, except one pilot, 13 gals. of oil, and 90 gals of gas.)	1584
Wing Loading	22.8 lb. per sq. ft.
Power Loading	11.5 lb. per hp.
Gasoline	200 gal.
Oil	13 gal.

Performance*

High speed	206 m.p.h. S.L.
Cruising speed	196 m.p.h. at 8,000 ft.
Climb at sea level	1,480 ft. per min.
Service ceiling	22,500 ft.
Landing speed	54 m.p.h.
Single engine ceiling	9,000 ft.
Single engine cruising	145 m.p.h.
Take-off run	750 ft. S.L.
Fuel consumption, cruising	32.4 gals. per hr.

* Data based on present model with Jacobs L-5 motors. Optional installation with Jacobs L-6, 330 h.p., or Wright R-760-E, 350 h.p., may be provided, which will increase performance from 5 per cent to 8 per cent.

Standard Equipment

Flight and power plant instruments as required by the Department for this type of airplane. Space is provided for Sperry instruments on a separate panel. Constant speed Hamilton Standard Propellers may be provided as additional equipment.

WRIGHT CYCLONES
Available with
2-SPEED SUPERCHARGING
and ICE-FREE
COMPENSATED CARBURETION

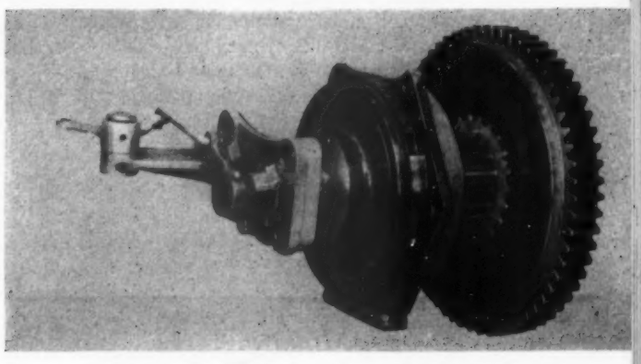
Two new exclusive engineering features are now available with Wright Cyclones which greatly increase their efficiency and performance at high altitudes.

1. Two-Speed Supercharging, developed by Wright engineers in cooperation with the U. S. Military and Naval Services, produces, in effect, "two-engines-in-one" and paves the way for stratosphere flying.

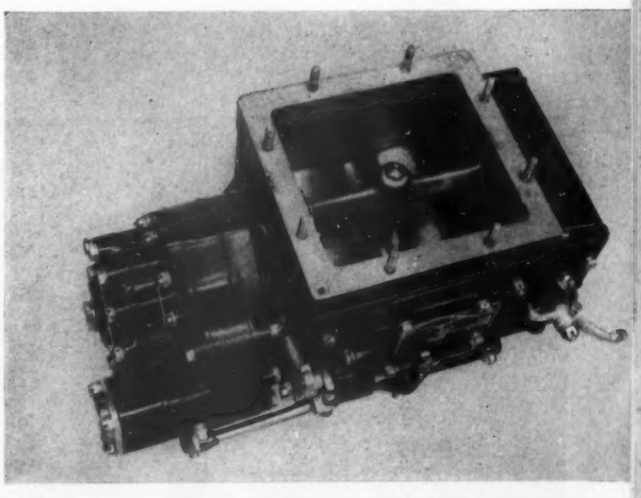
Two selective blower ratios are provided. In the low-blower position the Cyclone develops maximum power for quick take-off with heavy loads at sea level; in high-blower, the engine carries the rated power to greater heights—increasing the effectiveness of military and commercial aircraft by providing the high power required by modern operations both at sea level and high altitudes.

Compact in construction, weighing only 10 lbs., two-speed supercharging is furnished at a nominal extra cost, and is readily adaptable to all Wright Cyclone engines in production as well as modern Cyclones now operating in the field.

2. Ice-Free Compensated Carburetion, as accomplished with the Stromberg-Groves carburetor, is standard equipment on the G-100 Series Cyclone engines. Incorporating an entirely new principle of carburetion, it is not only immune to icing but provides mixture strength and power compensation for variations in altitude, eliminating the necessity for complicated mixture control devices.



The compact Wright 2-speed supercharger which converts Cyclones into "two-engines-in-one". Weighing only 10 lbs., it can be adapted to all modern Wright Cyclones.



Close-up of the ice-free, compensated carburetor now standard equipment on all Wright G-100 Series Cyclones.

"Fly With Wright the World Over"

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY
A DIVISION OF CURTISS-WRIGHT CORPORATION

AVIATION RADIO

Dialing the Air Waves with Don Fink

Radio on the DC-4

Includes 250-watt Transmitter and Four Receivers

DESCRIPTIONS OF RADIO EQUIPMENT on the Douglas DC-4, recently released by the Western Electric Company, reveal that the transmitter has a power output of 250 watts, some five times that usually used for transport work. Communication is available on any of ten crystal-controlled frequencies. The receiving equipment includes four units, each capable of independent and simultaneous operation. A crystal controlled superheterodyne serves for communication on assigned airline frequencies and on any desired frequency in the communication bands; the sensitivity of the receiver is regulated by a vacuum-tube circuit, independent of the master control, which serves only to fix the maximum sensitivity.

A beacon receiver, similar to the communication receiver but operating in the range from 195 to 415 kc., may be used with a single-wire antenna, or with a loop antenna for direction-finding. An auxiliary receiver covers all frequencies in the communication and beacon bands, and is capable of operation from battery supply when necessary. These three receivers are mounted, together with the transmitter, immediately behind the co-pilots position. From this panel, remote control cables are led forward to a control column between the pilot and co-pilot. Individual controls permit either pilot to connect his headphones with any receiver, without affecting the other headset.

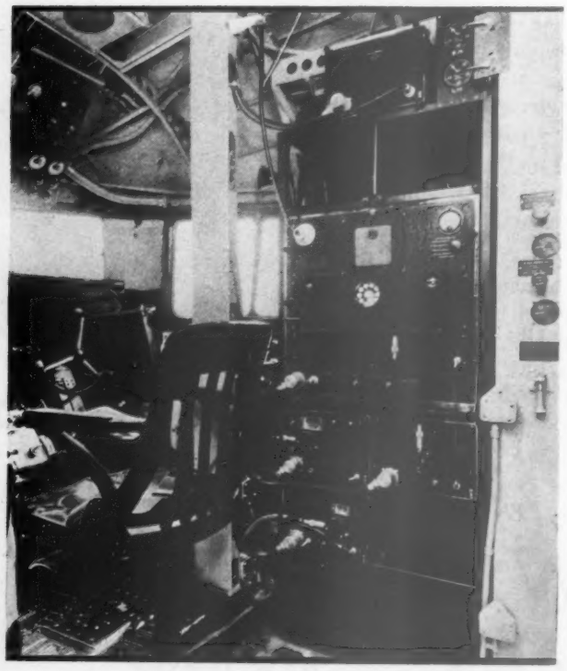
Changes in frequency, made simultaneously on transmitter and communications receiver, are accomplished by a ten-position rotary dial on the transmitter panel. Changeover from day to night frequency is effected by remote control from the control column between the pilots.

Provision for reception of the ultra-high frequency marker stations is made in the fourth receiver, a fixed-tuned crystal-controlled superheterodyne which requires no attention in flight. The output of this receiver is rectified and applied to indicating lights on the instrument panel, while aural monitoring of the marker signals can be obtained by switching the either headset from the control column. The entire power supply for the installation, exclusive of the emergency battery supply, is derived from the 800-cycle alternator used for supplying the ship's electric requirements. An elaborate interphone system, capable of connection with the telephone lines when the ship is on the ground, connects the two pilots, the flight engineer and the stewardess.

The specifications for the equipment, which was designed and installed by Western Electric, were laid down by the TWA, United, American, and Eastern Airlines.

DC-4's loop, mounted in the non-metallic nose

Transmitter, three receivers, and interphone amplifier mounted in the DC-4



New Products

Recent Announcements of Apparatus

BY AERONAUTICAL RADIO CO., an "Ear-Saver" for pilots, a filter device connected between the phone jack and the phones, and intended to limit the audio voltage applied to the phones to not more than 12 volts. Static crashes and other high intensity disturbances are thus limited, whereas the modulation of the signal is heard at the usual "comfortable" level of 4 to 6 volts. The device weighs 3 ounces, and is housed in a metal box, 3 inches in diameter and 2½ inches high.

By the Carter Motor Co. of Chicago, a new genemotor of high power output in relation to size and weight. The maximum output is 500 volts at 200 ma. Less filter, the unit weighs 10 pounds, measures 7 x 4 x 2⅞ inches. The bearings are permanently adjusted and self-oiling.

By the Triumph Manufacturing Co. of Chicago, a new series of components for the aircraft industry, the first of which is a Tone Oscillator, model 255, built to Bureau of Air Commerce Standards and supplied to such organization as Bendix Radio and the U. S. Lighthouse Service. Tone for modulation of beacon transmitters, blind landing systems, etc., is derived from the unit.

Remote Tuning

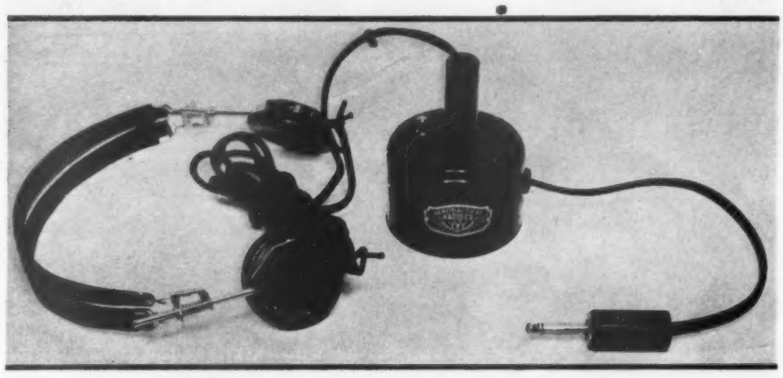
Lear Motor-Driven Loading Unit

FOR USE with a small fixed antenna which must be resonated to a wide range of frequencies, Lear Developments have recently produced a motor-driven antenna loading coil. The motor, similar to that used in the Lear automatic band-switching arrangement, rotates the entire inductance coil about its own axis. A rolling contact which rides on the turns of the coil shorts out the undesired turns, thus providing any required inductance up to the maximum of 60 microhenries. The motor is of the reversing type, and is controlled by a switch for increasing or decreasing the inductance. The weight of the unit is 1 pound, 14 ounces.

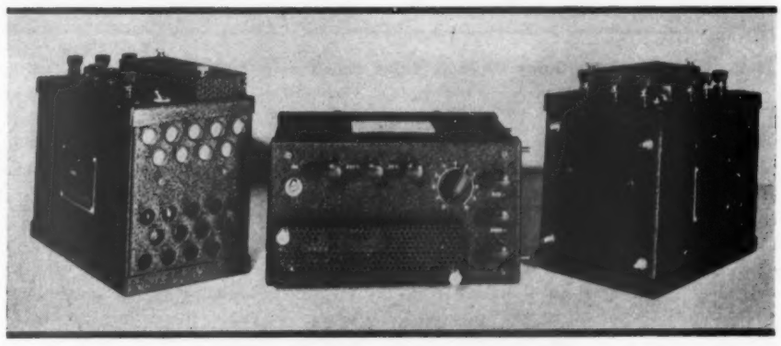
Publication

Loose-leaf Data on Radio Range

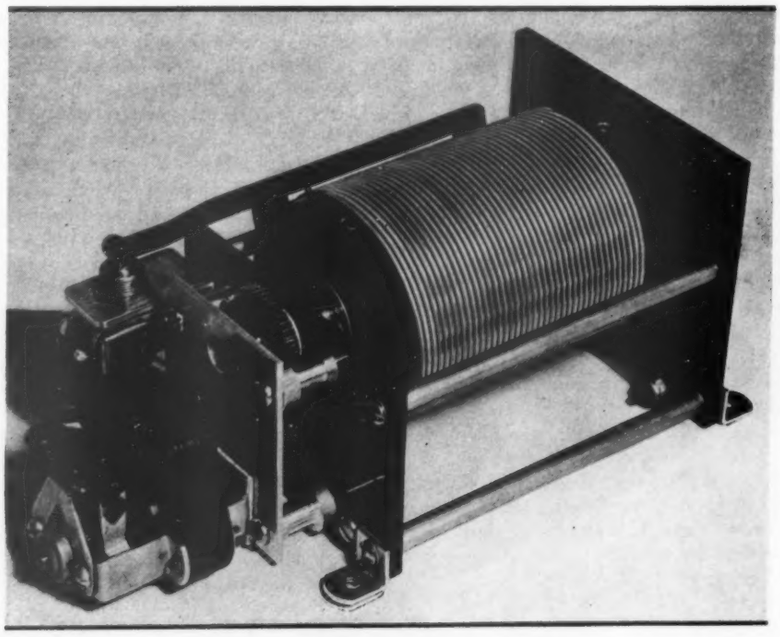
A CONVENIENT AND READILY ACCESSIBLE SOURCE of information on radio range stations in the U. S. is made available through Wm. F. Nicol of Dallas, Texas, who publishes "Practical Radio Range Data," a loose-leaf booklet of charts and data. A typical sheet, that showing the data for Chicago is shown in the illustration. On each sheet are included the true magnetic bearings of the beams, both to and from the cone of silence, the position of the A and N sectors, and position and height of major obstructions, distance circles in two-mile intervals, call-letters and frequency of the traffic control voice, and range services, and the schedule of broadcasts. All Department of Commerce and Municipal Radio Ranges are included. Information of Military and Naval ranges, as well as those maintained privately are to be included as information is made available. The service includes replacement of sheets as revisions are necessary, on a twice-per-month schedule.



Aeronautical Radio's "Ear-Saver," a volume limiter for headphone use



Triumph tone oscillators for modulation



Motor-driven unit controls antenna loading

Seeing is Believing

(*Continued from page 31*)

Instructor Camy explains valve action of a radial engine.

that "One picture is worth ten thousand words," by giving the students working models, as well as pictures. Perhaps we should say that for relative instruction value "One working model is worth one hundred thousand words." Starting with such basic instruction as that dealing with mechanical movements we carry the use of pictures, charts, diagrams, sectioned mechanisms and working models up through every phase of instruction, including wind tunnel work and radio. And we are constantly building new models, while our instructors wrinkle their brains trying to think up new ways of visualizing old problems. For example we have recently completed a series of models to demonstrate problems in fundamental physics and descriptive geometry. These models are of glass in the form of cubes, cones, cylinders, etc., and are sectioned at various points to show the projection of the model in different planes. By this approach to descriptive geometry we multiply the amount of knowledge imparted to the student in a given time, and save much puzzlement formerly occasioned the student who was not imaginative and who had difficulty therefore, in visualizing an imaginary plane cutting through an imaginary object to produce an imaginary projection.

Among our more simple models, or sectioned parts, are the display boards on which we mount examples of parts or materials, such as bolts and nuts, spark plugs, superchargers, connecting rods, etc. We teach a knowledge of woods by referring to a cabinet in which we have actual examples of various types of woods, including especially those types of spruce which are not serviceable for aircraft work due to various reasons, such as knots, compression failure during growth, etc. We completely section the engines, carburetors, magnetos, propellers, propeller controls on constant speed type propellers, fuel pumps, etc. Thus a student can look right inside the mechanism he is studying and see the relationship of the various parts. We also section propeller blades to show pitch and section at various stations along the blade. And we mount complete fuel systems, valve actions, etc., on boards so that the parts appear in proper relation to each other, and yet are separated to show each individual part.

We also use these mounting boards to show typical examples of fittings, welded and otherwise, all types of welds, samples of various fabrics and finishes, different types of castings, and typical failures in various types of forming or casting metals. Thus we can demonstrate the defects in forgings which result from use of improper dies, the porosity or blow-holes in castings where the technique was not correct. This familiarizes the student with all types of materials, and of failures of such materials or fittings, in a most graphic way.

Our more complex sectioned parts show such instruments as the Sperry Gyro pilot, or altimeters, air speed indicators, chronometic tachometers, turn and bank indicator, directional gyro, etc. In the field of radio we have developed a complete set of models showing various circuits and relays in such a way that the student can practically see the flow of current.

For certain advanced instruction we make good use of the oscilloscope to show vibration, and wave patterns; and of the stroboscope to show motion at rest. For demonstration of problems in structures we use a photo-elastic machine which operates on the principle of polarized light. By projecting a ray of light through a transparent model we are able to show on a screen actual stress reactions of the model when forces are applied. Models used for such work are simple forms of glass, bakelite, or celluloid.

One of our most useful visual projects for aerodynamic instruction is the smoke tunnel which we use in conjunction with a projection lantern to throw air flow patterns on a screen. The students can thus see, in enlarged form, the action of the air over airfoils or around various forms.

Even in flight training we find the visual instruction method applicable through use of the Link trainer. The advantages of the Link system are well known, but one of the most valuable aspects of the Link system is that it permits a student to work out instrument approach problems and then go back to the chart on which his work is recorded and study visually his approach technique.

Summing up our own experience with visual education methods, and our own feeling that such educational methods are still in their infancy, we feel impelled to remark that such methods supplement rather than supplant the text books. The text book is, after all, the background of all school work. But before the days of printing and text books teaching was done successfully and largely by actual demonstration methods. Text books have carried us through an era of specialization on printer's ink during which many instructors and students came to the attitude that everything worth while was to be found in books. We feel now that we have gone beyond the books. We believe that our visual education methods are a step forward, based on the solid foundation of technical experience and good text books, but carrying educational methods into new and higher ground.

The Birdmen's Perch

FINAL ELECTION RETURNS: The bird and the propellor are hereby making their last appearance on the Perch until we either see such a collision for ourselves or someone makes a full-color, slow-motion movie of one. The result of our election was a deadlock; neither group had a majority, which proves exactly nothing. So as far as we're concerned that's that. Anyway, boys, no matter what side you were on, it was a swell argument.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

POETS' CORNER

One of our favorite correspondents is W. Blake Henderson. There's a man who fairly leaps into action at the sight of our puzzles . . . sends us slightly sarcastic answers worked out to 10 decimal places, when they're too easy, and gracefully inquires *in verse* when one has him stumped a little.

Fact is aviation bugs are pretty poetic. We're serious . . . one of these days you'll see a regular Poets' Corner in the Perch if we have to award a monthly prize (as yet un-named) for the best sonnet about Gulfpride and the Alchlor process!

At any rate, Poet & Puzzler-Laureate Henderson's offering is a mite long to be printed, but we'll give you the last quatrain. It's about our June puzzle . . .

"So I want to know:
What *is* the answer?
If the wind *did* blow
Which way—*how* fast, sir?"

SHARPEN YOUR PENCILS

On our library shelf there are three volumes comprising a work called "Why Every Aviator Should Use Gulf Products." They stand in order on the shelf and are labelled Vol. 1, Vol. 2, Vol. 3.

Vol. 1 has covers each 3/8" thick and

the leaves when pressed together are 1 6/7" thick.

Vol.2 has covers each 3/8" thick and the leaves when pressed together are 2 3/16" thick.

Vol.3 has covers each 3/8" thick and the leaves when pressed together are 3 5/16" thick.

The Volumes are page-numbered as follows:

Vol. 1 from 1 to 60
Vol. 2 from 61 to 150
Vol. 3 from 151 to 300

Now, a book-worm begins at Vol. 1, page 1 and eats directly through to Vol. 3, page 300 by the shortest route. How many inches does he (or it) eat through?

(Send your answer to T.W.T. to see how good you are.)

THIS MONTH'S WHOPPER

Dear Major:

One day, when I got home from work, I see a whole slew of reporter fellows taking pictures of my little Sally and asking her a million and one questions.

It seems that Sally—she's going on 7—won some sort of a big race.

How'd it happen?

Well, last Christmas I bought Sally one of those tricycles. And it seems that on this particular day she finds a can of Gulf Aviation Gas I had around. And she sprinkles some on her tricycle just for the fun of it.

Well, sir . . . first thing you know, she's shooting off on the thing like a bat out of the hot place. Heads right for Grantham Avenue where they have the auto races. Can't stop the darned craft! Goes lickety-split through the fence and right out on the track! And darned if she doesn't find she's in a race with some of the fastest drivers this side of Indianapolis. Laps the field once! . . . laps 'em twice! . . . and scoots over the line winner by a whole brace of furlongs! Only thing is she can't stop and they have to put a net over the track to catch her.

I don't think racing's any life for a kid just going on 7 and so I've forbidden Sally to touch my Gulf Aviation Gas till she gets older. **Hal Bers**

CITATION

Slightly late but none the less sincere are our congratulations to Ken Kress and Glenn Englert who flew a Piper CUB from Newark Airport to Miami and back . . . non-stop.

What with some incidental wandering over the Florida swamps and a few assorted tight squeaks (once the gas was down to 10 minutes' supply) the boys packed quite some experiences into their 63 hr. 54 minute meander. Flights like theirs are worth-while contributions to aviation . . . so again congratulations!

Incidentally Kress and Englert used only Gulf Aviation Gas and Gulfpride Oil on this flight and report perfect performance from both. And a credit also to the Gulf crews at Newark, Raleigh, Jacksonville, and Miami who helped in the ticklish refueling.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

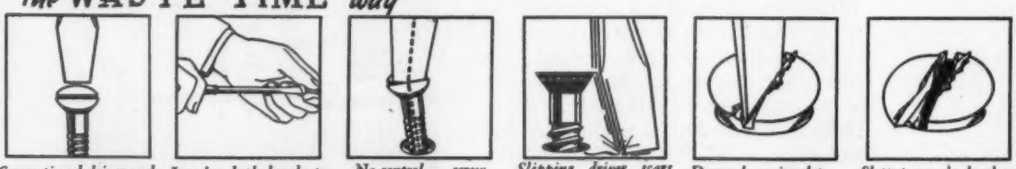
GULF **GULF AVIATION PRODUCTS**

So cost departments say — "It's CHEAPER to drive Phillips"

The manufacturers who were the first to standardize on patented Phillips Recessed Head Screws are the ones who have to cut costs without cutting quality — airplane factories, auto body makers, electrical appliance manufacturers, fine furniture makers. On all counts they've learned that the Phillips Screw is a low-cost fastening — faster assembly, less spoilage, fewer screws, longer tool life, better worker attitude. No wonder they say, "We could not afford to be without Phillip's Recessed Head Screws."

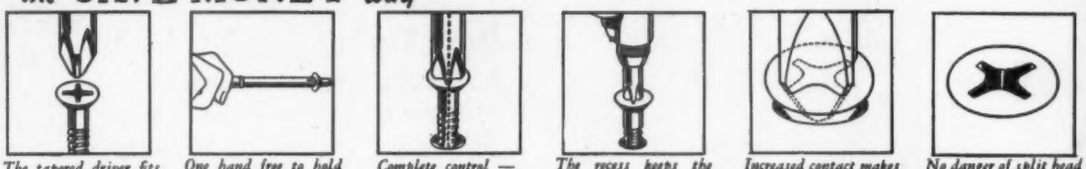
MEANWHILE, quality won't suffer. In fact, quality is improved — as evidenced by the fact that many manufacturers are instructing salesmen to make a sales point of the new fastening method. The public is learning that products assembled the Phillips way are stronger, more resistant to vibration, better-looking and safer. Any of the manufacturers listed below will tell you more. Ask for Folder B.

the "WASTE TIME" way



Conventional driver and slotted head screw — *It takes both hands to start and drive* — *No control — screw goes in crooked* — *Slipping driver scars surface or injures workman* — *Driver loose in slot tears the metal* — *Slotted screw's head may split when tightening*

the "SAVE MONEY" way



The tapered driver fits the Phillips recess — *One hand free to hold work — no screws dropped* — *Complete control — straight-line driving* — *The recess keeps the driver from slipping — no scars* — *Increased contact makes driving easy — prevents burrs* — *No danger of split head — screw can be set up tighter*

ANY TYPE OF DRIVER CAN BE USED

This is the Genuine Patented Phillips recessed head

— proven most successful for all types of industrial fastening.

Note the tapered recess in the screw — its angle was worked out after months of tests to determine the most efficient form of recessed head, utilizing the driver's *maximum* turning power. Note the flat surfaces — no curves except at the rim. That prevents the driver from burring the screw. Cold forged to tolerances of plus or minus .001" — to guarantee a perfect fit.

FEWER DRIVER SIZES — 2 sizes of Phillips Drivers fit 85% of all screw sizes commonly used. 4 driver sizes fit the entire range of screw sizes, instead of 7 as with slotted screws. Made by many leading driver manufacturers. Ordinary drivers can also be used.

PHILLIPS RECESSED HEAD SCREWS

Gain Time . . . Guide-Driver . . . Guard Work

U. S. Patents on Product and Methods Nos. 2,046,345; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

MACHINE SCREWS — SHEET METAL SCREWS — WOOD SCREWS — STOVE BOLTS

CLIP HERE AND MAIL TO ONE OF THESE MANUFACTURERS

American Screw Company, Licensor
Providence, Rhode Island

Continental Screw Company
New Bedford, Massachusetts

Corbin Screw Corporation
New Britain, Connecticut

National Screw & Manufacturing Company
Cleveland, Ohio

Parker-Kalon Corporation
New York, New York

Russell, Burdsall & Ward Bolt & Nut Co.
Port Chester, New York

Please send me — without obligation — Folder B on patented Phillips Screws.

Name .....

Company .....

Address .....

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Portable X-Ray

Equipment and dark room mounted in trailer

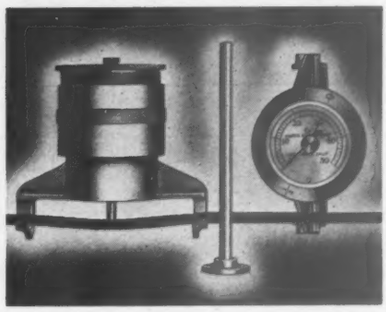
WITH THE GROWING IMPORTANCE of x-ray examination of materials used in aircraft manufacture several firms have specialized in the work of applying x-ray equipment to this field. Among these a rather unique application has beeen made by the St. John X-ray Service, Inc., of Long Island City, N. Y. This firm has developed a complete x-ray equipment mounted on a trailer so that it may be towed from place to place for x-ray study in plants which cannot afford, at this time, permanent x-ray laboratories. The St. John equipment is compact and complete, weighs approximately 3,000 lbs. complete, and may be towed by any ordinary small car with ease. The trailer may be used as a field dark room. The x-ray equipment includes a new tube which is capable of penetrating 3 inches of steel in a one-minute exposure.

Interested manufacturers may contract for the services of this equipment, or the St. John Company will sell such portable units and train technicians in their use.—AVIATION, *September, 1938.*

Measures Bumps

Kollsman Announces Service and Test Accelerometers

KOLLSMAN INSTRUMENT COMPANY has developed the Type 312 accelerometer; an extremely rugged instrument which does not require locking of its mechanism during transportation or in storage, and which will not encounter errors due to extreme shocks or excessive vibration. The design is such that there is no error in indication due to accelerations in a sidewise direction. The instrument carries two pointers, one indicating continuously and the other showing maximum stress value encountered until reset by a small knob at the bottom of the dial. A new line of accelerometers particularly suited for performance testing has also been announced by Kollsman.—AVIATION, *September, 1938.*



Martin-Decker airplane type tension indicator.

How Tight?

An Airplane Type Tension Indicator by Martin-Decker

THE ADVENT of large multi-engined aircraft has greatly increased the number of control cables used, which makes the use of some accurate cable tension indicating device essential. To meet this need a special airplane type tension indicator has been offered by the Martin-Decker Corporation, Long Beach, Calif. Made in two sizes, Models 2 and 3, the Martin-Decker airplane type tension indicator is light and compact. Model 2 weighs 2 lb. 9 oz. takes cable sizes of 1/8 to 1/4 in., and has a capacity up to 250 lbs. Model 3 weighs 2 lb. 13 oz., takes cable sizes from 1/4 to 1/8 in., and has a capacity of 1000 lb. Both instruments make use of a cylinder incorporating a pressure diaphragm and a gauge for transposing line load into pounds gauge reading. Two fixed and one moveable cable contact points in the base of the instrument serve to affix it to a cable for test. Provision is made for calibrating for temperature changes and for compensating for cables of varying sizes within the capacity of the instrument.—AVIATION, *September, 1938.*

Spotlight

S & M. landing lights installed on Hughes' Lockheed.

SPECIALIZING in spotlights for vehicles of all types, the S & M. Lamp Co., Los Angeles, Calif., has developed many unique lights for automotive, marine, or aircraft use. The standard line of S & M. aircraft landing lights includes a series of retractable lights, a series of leading edge lights, and a series of lights for installation in fuselage nose, etc.

In connection with the recent flight around the world by Howard Hughes two landing lights were mounted in the fuselage of his Lockheed 14 behind the Plexiglas nose cone, one a standard leading edge landing light, and the other a special half million candlepower searchlight.—AVIATION, *September, 1938.*

Kollsman accelerometer.

S & M. lights on Hughes' plane

MENASCO OVER POPOCATEPTL

Wherever the going is tough, Menasco engines daily prove their championship performance, stamina and dependability. True to this tradition, the Menasco 150 h.p. supercharged engines that power the Mexican Air Force fleet of Ryan trainers are doing an outstanding job. Taking off from Mexico City at 7,200 feet and flying in formation over Popocateptl (Mexico's highest extinct volcano) these engines must deliver faultless performance at well over 18,000 feet. Whether your choice is the husky 50 h.p. Menasco for light planes or the sleek in-line 260 h.p. supercharged Menasco, you can be certain that no engines in the world are more expertly engineered, manufactured with finer precision or tested with greater care. Menasco Manufacturing Co., Los Angeles, California.

ANY AIRPLANE SELLS BETTER WHEN POWERED BY MENASCO

ABILITY
"Delivery" often assumes importance equal to specifications. Back of Consolidated's success in the air, is one of the world's newest and most modern aircraft factories. Over 650,000 square feet of floor and yard space. Planned exclusively for large-scale aircraft production. Located in a favored Southern California clime where "weather" does not interfere with production schedules. Consolidated possesses unusual ability to produce.
Consolidated PBY Series
Available for export
Amphibian gear optional
CONSOLIDATED AIRCRAFT
CONSOLIDATED Aircraft CORP.
SAN DIEGO . . . . . EST. 1923

THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

SEPTEMBER 1938

Nazis Run Off With Atlantic Show

(Story on page 54)

[illegible]

International

SO HELP ME: Aug 8 Judge Harold M. Stephens of the District Court of Appeals administered the oath of office to the new Civil Aeronautics Authority in the reception room of Sec'y Ropers' Commerce Building Office. Left to right, facing His Honor are—Edward J. Noble, Chairman; Harllee Branch, Vice Chairman; G. Grant Mason, Jr.; Oswald Ryan; Robert Hinckley and Clinton M. Hester, Administrator. Story on page 57.

OFF FOR ALASKA: Early last month Pan American Airways began weaving in another link in the skein of its long air line system. To survey a route between Seattle and Juneau, Alaska, it sent a Sikorsky S-43 amphibian on a 1,500 mile transcontinental from Miami, to Seattle via Glendale, Cal. The crew lined up before the take-off at Miami, left to right—Communications Officer Earl E. Martin; Engineering Officer John D. Donnelly; First Flight Officer A. Norman Gentry and Captain John M. Steele. Story on page 52.

SPOT LANDINGS ON THE MONTH'S NEWS

The U. S. falls far behind in F.A.I. records—So What?

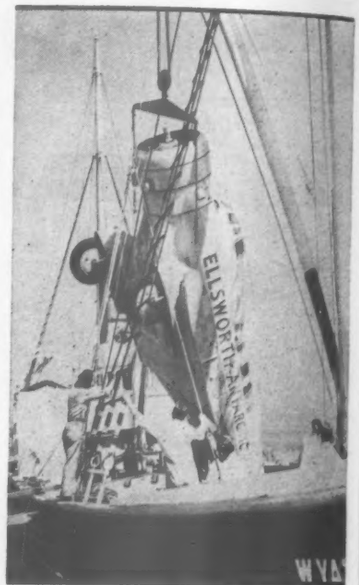
America's record list has been dwindling like a snowball in a tropical air mass. By the latest F.A.I. count, France now holds 52 international marks, Italy 33, the U. S. 19, Russia 18, Germany 17, Czechoslovakia 13, Great Britain 10, Poland 7, Belgium 3, Austria 2, and Japan 1. Our esteemed friends in the National Aeronautics Association are doing considerable wailing about the situation and it would be nice if the owners of some of our best aircraft would get out and bring some records back home to roost. But personally, we never have been able to get up very much excitement as to whether the U. S. is leading the parade or trailing a poor third. For one thing the number of recognized marks always seemed to us to be excessive especially, when for some reason, marks for women are listed sparately and are evidently cherished by record fans just as much as any other. And certainly few people can really believe that the total number of F.A.I. records held by a country at any particular time is a true reflection of its aeronautical prowess. For example: Great Britain which for years possessed only one or two marks and now holds ten, certainly doesn't rate a seventh position in world aviation.

A real air line to Alaska, forecast by Pan American Airways' current survey flights should make real sense and quickly become a national asset. The Territory has been one of the most air-minded bits of America for a decade and Pacific Alaska Airways, Pan American subsidiary managed by Joe Crosson, has set up services from Nome to Juneau via Fairbanks which have revolutionized the whole concept of travel there. Whether closing the Seattle-Juneau link portends an eventual air service to Russia is difficult to say at this time. Lending some weight to the thought is the current visit of Colonel Lindbergh to Russia. As Pan-American's technical adviser he may well be working on such a project.

The loss of the Hawaii Clipper still seems utterly incredible. A clipper crew getting ready for a Pacific crossing holds "boat drill" in the emergency life raft, and checks over hundreds of pounds of emergency equipment: kites, flares, life belts, rations, water, etc. That the huge ship itself and all the equipment in her should disappear without leaving a scrap of debris floating in the wide area so thoroughly searched by the army and navy just does not seem possible. Aside from the shock of the accident and the effect it will have in the public's acceptance of transoceanic air transport, the industry could ill afford to lose Captain Terlesky, his crew and the two members of his passenger list who were aviation officials. One, K. A. Kennedy served for years with United Traffic Department then left to do a bang-up job in organizing Pan-American's traffic sales on the Pacific Coast. The other, E. E. Wyman was long assistant to President Trippe of Pan-American airways but had recently joined Curtiss-Wright as a vice-president. The accident of course, will work a distinct hardship on Pan-American trans-Pacific operations. Most airline men have always thought the Pacific Division was doing an astounding job running an 8,600 mile air line with only three planes. Now with two, every third weekly schedule will simply have to be omitted until the arrival of the Boeing equipment relieves the shortage.

It had better be good is our reaction to the announcement that the week from October 1 to 9 will be observed as National Air Travel Week by the country's air lines. The public is called on to observe so many This and That National Weeks that a lot of people in the industry have questioned the advisability of running a second publicity drive during the same year as Mr. Farley's brilliant National Air Mail Week. However, we are ready to cheer at any indication of joint sales efforts by our all-too-competitive air line outfits. Besides the preliminary announcement for the October business does sound pretty good. T. Park Hay has been appointed National Director of the campaign, Harold Crary, Vice-President of United Air Lines, Chairman of the Special Committee on National Air Travel Week of the Air Transport Operators Association, announced today. Other members of the Committee are: Paul H. Brattain, Vice-President Eastern Air Lines, Charles H. Rheinstrom, Vice-President American Air Lines, J. B. Walker, Vice-President Transcontinental & Western Air, D. D. Walker, General Traffic Manager Chicago & Southern Air Lines, Charles E. Beard, Vice-President Braniff Airways, and Victor Chenes, General Traffic Manager Pan American Airways. That's a lot of talent packed into one committee. The outline we've seen of general plans seems adequate—if not startling. October would be a good month to have some extra traffic in. Let's Go.

A new air pact with Canada or rather three brand new aeronautical arrangements were completed July 28, through an exchange of notes between Secretary Hull and Sir Herbert Marler. The new arrangement will supersede a single agreement negotiated in 1929. Interesting features are: recognition of each others' air worthiness certificates and the issuance by each country of pilots' certificates to the nationals of the other.



Wide World

SAILING SOUTH: Lincoln Ellsworth's Northrup Delta goes into the hold of the Wyatt Earp.

Our aerial explorers are once more making headlines, Richard Archbold reports from New Guinea that the Guba, manned by its regular crew of five, has begun flights from Hollandia on the coast in to Lake Habbema, a small isolated body of water at approximately 11,000 feet altitude in the heart of the mountainous section of the unexplored interior. . . . Lincoln Ellsworth's Northrop Delta has been loaded upon the Wyatt Earp and started off for Antarctica via Cape Town, South Africa where Ellsworth, his wife and Sir Hubert Wilkins will join the expedition. Flights are to be made to determine how far the Polar Plateau extends toward Africa and whether the mountains of Victoria land run across the magnetic pole to the opposite side of the continent. The expedition will leave Cape Town about October first. James H. Lymburner, a reserve pilot in the Royal Canadian Air Force will be Ellsworth's chief pilot. T. R. Treice will be flight engineer and co-pilot . . . The Soviet government has finally decided to give up the search for the N-209, the plane in which Sigismund Levenevsky and a crew of five started across the pole to America on August 12, 1937.

Uncle Sam and John Bull have agreed to share the control and the use for commercial aviation of Canton and Enderbury Island in the Phoenix group. The question of ultimate ownership seems to be indefinitely postponed. Lying 1,850

miles southwest of Hawaii, the two map dots are on the air route between Honolulu and Aukland, New Zealand and offer a good stepping stone for prospective air line operations in that region. For this reason they are a lot more important than Howland, Jarvis and Baker Island which America staked a claim to after Pan American's trans-Pacific route brought out the value of Midway and Wake. Howland, Jarvis and Baker are too far to the west to be of much good to an air line. Not mentioned in the announcement of the agreement is the rumored interest of the U. S. Navy in Canton as a base in its proposed mid-Pacific aerial patrol line extending down from the Aleutians to Hawaii thence to Samoa. If the U. S. should win undisputed possession of Canton, it would lend itself as to constant use by naval flyers on any such patrol.

The whole industry has a stake in the hearings Sept. 8 by the Public Contracts Board to set a wage minimum for manufacturers building aircraft, engines or accessories for the government. On July 1, after earlier hearings, the P. C. Board, acting under terms of the Walsh-Healey Act proposed a minimum hourly wage of 60 cents with the stipulation that not more than 15 per cent of a factory's employees might be classed as "learners" and be paid as low as 40 cents. Opposing the ruling, manufacturers point out; that the average hourly wage in the American aircraft industry is already 70.4 cents; that at present about 30 per cent of all employees are receiving less than the proposed 60 cent minimum; that to raise these workers to 60 cents would require boosting other classes to maintain skill-differentials; that government contracts bulk so large in the industry's business, it would be impractical to pay different scales on non-governmental orders. Estimates are that a 60 cent minimum would mean a net raise of 5 to 10 per cent in labor costs. Since labor costs represent about 40 per cent of the cost of an airplane this would mean an average increase of from 2 to 8 per cent in all military aircraft built in this country; probably a similar advance in prices for our transports and some appreciable increase in all other classes. General expectation, however, is that the P. C. Board will stand by its proposal and that the 60 cent base will eventually become law.

The Administration intends to go ahead spending about $30,000,000 a year, mostly through WPA, on civil airports. Major McMullen's WPA airport section, which has been attached to the Bureau of Air Commerce, will be taken over by the Authority and authorized to continue its national survey of airports, which is due, according to the law, by February 1, 1939. In fact it is said that the Authority favors giving the section more prestige to facilitate its work. Best guess is the Authority will recommend Authority control for many airports next Congress.

D. S.

HERE'S WHAT DC-4 CREWS WILL LOOK AT

The key numbers on the photograph identify the instruments as listed below.

1.—Brake Torque Test Gauge (measures actual horsepower delivered to propeller), Brake Booster Test Gauges (shows amount of hydraulic pressure delivered to brakes).

2.—Switches for Feathering Pumps Synchroscope (synchronizes four engines). Propeller Feathering Controls, Rheostats for Lighting.

3 and 4.—Generator Switches, Auxiliary Engine Ignition Switch.

5.—Temperature Indicators (oil temperature, two cylinder head temperatures on each engine, carburetor air temperature), Temperature Switches, Switches for Landing Lights, Pilot Heater, Instrument Panel Lights, Cabin Dome Lights, Reading Lights, Cabin Seat Belt Sign, Windshield De-Froster and Engine Ignition Switches.

6.—Door Open Warning Light, Ground Plug in Light, Auxiliary Engine Fire Warning Light, Auxiliary Engine Oil Pressure Gauge Lights, Prestone Temperature Gauges, Voltmeters, Running Lights Switch, Instrument Panel Lights Switches, Ammeter, Spot Light, Compress Light.

7.—Rudder Tab Adjustment, Compass, Propeller Unfeather Control, Fuel Totalizer By-Press Control.

8.—Window Locking Handle, Pilot's Microphone, Radio Selection Panel (for interphone service to crew and outside phone service), Handle for 1,500 watt retractable Landing Light.

9.—Turn and Bank Indicator, Clock, Sensitive Altimeter, Directional Gyro, Accelerometer, Air Speed Indicator, Instrument Panel Light, Artificial Horizon, Vertical Speed Indicator. Space reserved for blind landing instruments.

10.—Directional Gyro-Automatic Pilot, Rudder Control Adjustment, Dump Valve Controls, Vacuum Gauge for Automatic Pilot, Aileron Control Adjustment, Bank and Climb Gyro-Automatic Pilot, Elevator Control Knob, Level Flight Knob-Automatic Pilot.

11 and 12.—Instrument Panel Light and Engine Cowl Flap Controls, Clock, turn and Bank Indicator, Directional Gyro, Instrument Panel Light, Sensitive Altimeter, Spare Light Bulb Holder, Artificial Horizon, Air Speed Indicator, Outside Air Temperature Gauge.

13.—Exhaust Gas Analyzer, Landing Gear Warning Lights, Wing Flap Indicator, Oil Pressure gauges, Tachometer Gauges, Manifold Pressure Gauges.

14 and 17.—Control Wheels and Columns.

15.—Rudder and Brake Control.

16.—Propeller Pitch Controls, Throttle and Propeller Control Brakes, Elevator Tab Control, Fuel Quantity and Flow Gauges, Throttle Controls, Fuel Selector Controls.

18.—Automatic Pilot Oil Pressure Gauge, De-Icer Gauge, Landing Gear Oil Pressure Gauge, Windshield De-Icing Hand Pump, Main Hydraulic Pressure Gauge, Vacuum Gauge, Vacuum Gauge Selector, Turn and Bank Selector, Gyro and Horizon Selector, Co-Pilot's Microphone, Exhaust Analyzer Switch, Automatic Pilot Gyro and Horizon Selector.

19 and 21.—Pilot's and Co-Pilot's Seats.

20.—Carburetor Air Temperature Controls, Auxiliary Fuel Gauge, Pump Knob, Wing Flap Control, Landing Gear Control, Automatic Pilot Servo Speed Control, Carburetor Mixture Controls, Automatic Pilot Servo "On-Off" Control, Parking Brake.

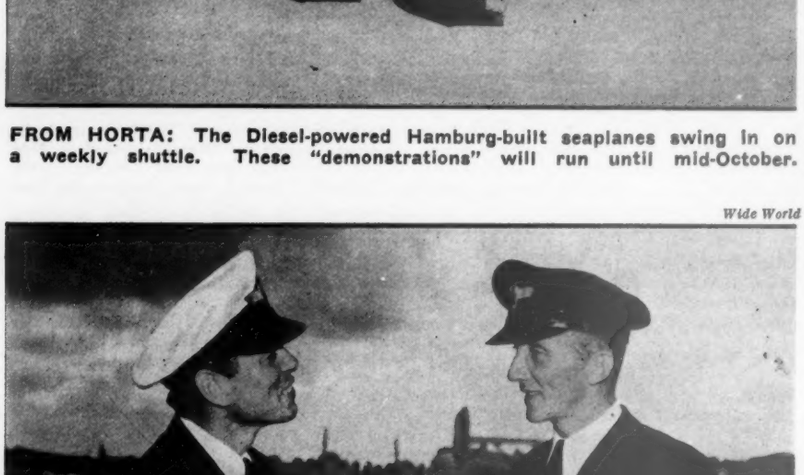
Germany Grabs Atlantic Spotlight; England Exits Briefly; France Waits Cue

IF THERE WERE NOTHING TO IT save who could put on the best show this Summer, the North Atlantic would right now be staked out as a German airway. Promptly on schedule the mothership Schwabenland, anchored off the Azores, fired the Diesel-powered seaplane Nordmeer down its catapult on July 21. Right on schedule the Nordmeer swung in over the Port Washington, Long Island base a little over 17 hours later. The next Monday evening the mothership Friesenland, anchored in Long Island Sound, shot the Nordmeer off for her return trip. Meanwhile the Nordwind had arrived that morning. Since then the two ships (a third seaplane, the Nordstern, is standing in reserve at the Azores) have been quietly shuttling back and forth. One comes in every Monday morning; the other starts back that evening. And they're going to keep that up all Summer, right into the middle of Oct.

But that, after all, is an old story. The Germans showed us the same technique first in the Fall of 1936 and then repeated it all last Summer—the same ships (except for the Nordstern which is newer and a little faster) many of the same personnel. So, on Aug. 11, with very little fuss or feathers the Germans sent us Captain Alfred Henke in a big Folke-Wulf Condor transport powered with four familiar looking Pratt & Whitney Hornets (built by B.M.W. under license). That was something. The "Brandenburg", against steady headwinds, covered the 3980 land miles of the non-stop distance between Berlin and Floyd Bennett Field in just under 25 hours. It was merely a demonstration, said Capt. Henke. Although the ship normally carries 26 passengers on Lufthansa runs, on the Berlin-N. Y. hop it could have carried only a very moderate mail load. Perhaps, the Captain hoped, the flight would call America's attention to Germany's seaplane flights. That's all there was to it. Aug. 14, the Brandenburg wheeled out onto the run-

Wide World

FROM BERLIN: The big Folke-Wulf "Brandenburg" rolls to a stop.



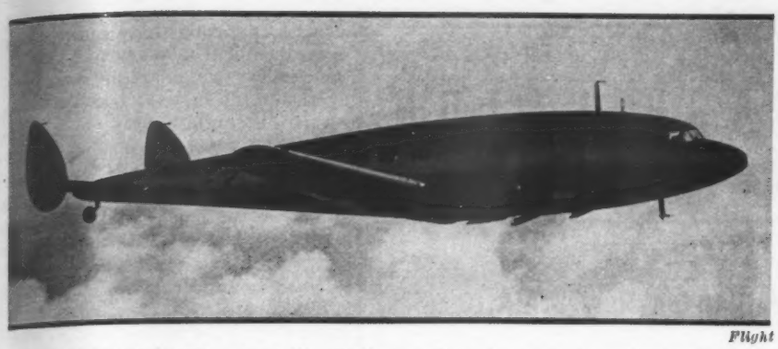
FROM HORTA: The Diesel-powered Hamburg-built seaplanes swing in on a weekly shuttle. These "demonstrations" will run until mid-October.

Wide World

CONGRATULATIONS: Capt. Hans Werner Von Engel of the Nordwind (right) shakes hands with Capt. Joachim Blankenburg of the Nordmeer upon the latter's arrival at Port Washington after his hundredth crossing of the (North and South) Atlantic.

Wide World

GREETINGS: Captain Alfred Henke of the Brandenburg steps aground at Floyd Bennett after his flight with three crew-mates from Templehof.



Flight

FROM HATFIELD: The shark-like "Albatross" is due over in early September.

way and roared off again. This time, with a good tail wind at 12,000 ft., Henke pushed along to land at Templehof in six minutes under 20 hours. Average speed, counting a detour around a low, something just over 200 m.p.h. Now talk is that the German government will give Henke another plane to push around the world in another "demonstration". What all this German effort is going to mean in terms of U.S. permission for a German transport line to operate to our shores, is not yet clear. However, America's steady refusal to let Germany operate here until some American company is good and ready to operate to Germany, becomes steadily harder to maintain.

The part written for our British cousins, calls for less time on this Summer's stage. But its a good spectacular part none the less. The Mayo Mercury found its way back safely to Southampton on July 27 after stops at Montreal, Botwood, the Azores, and Lisbon—the first time anyone has taken that route for some years. As we go to press it is expected back here on a second visit almost any day. The general reaction among American designers seems to be that the whole piggy-back airplane (British: picka-back aeroplane) idea has now been brilliantly demonstrated as feasible. Its main applications however, will probably be more military than commercial. Cheap small bombers might well be thus given a boost up at the start of a mission and become the more formidable for it. Commercially, however, recent developments in powerplant, propeller and plane design seem to render Mr. Mayo's clever plan obsolete before it gets really under way.

Much more permanently interesting is the visit of the deHavilland "Albatross" landplane scheduled for early September and the crossing (possibly after refuelling) of the beefed-up Empire Boat "Cabot" scheduled for the end of the same month. The Albatross is a monoplane of extremely sharkish lines and of wood and plastic construction. Its cockpit is reported as a bit cramped, but its four Gypsy-12 engines of 510 hp. each give it a cruising speed of about 212 m.p.h. It will be definitely something to see.

Air France seems to be struggling in her typically Gallic fashion to get underway, at last, with her big, old Lieut. de Vaisseau Paris. Six round trips were originally scheduled for this 40-ton, six-engined giant. Last month it finally did start, but turned right back with a lame prop.

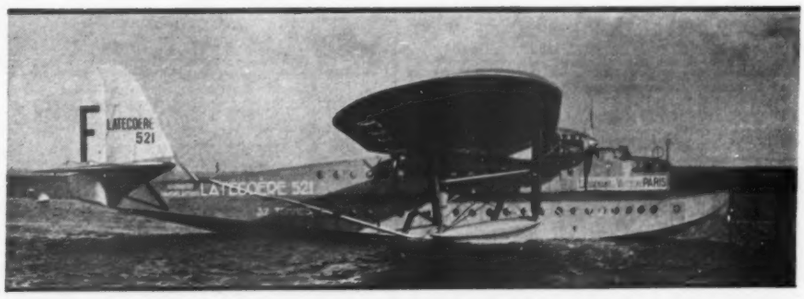
Meanwhile, no matter how interesting to airplane design fans this Summer's show may be, the whole project of establishing a full air transport service for passengers, mail and express across the North Atlantic must still wait for bigger ships than any of the aircraft taking part in it. Just how long that will be depends on the construction speeds of Boeing here, Short in England, the nationalized plants in France, the war-geared aircraft industry of Germany.

International

COMPOSITES: The men who proved "piggy-backing" practical. Left to right—Major R. H. Mayo, the designer; Capt. Wilcockson, pilot of the Maia; A. J. Coster, radioman on the Mercury and Capt. D. C. T. Bennett, its pilot.

International

FROM SOUTHAMPTON: The Mercury rides at anchor at Port Washington.



FROM BISCAROSSE: The veteran Lieut. de Vaisseau Paris is scheduled to hop "any time" for New York. Six roundtrips were on the original plan.

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

Industry Watchful—Waiting on New C.A.A.

Aviation has been taken over, willingly or not, from the old pioneering technician group and turned over to control by a board of statecraftsmen, lawyers, and business men. Thus Washington observers sum up the vital change that has been accomplished. Some say the new regime is all to the good; some will wait a bit sadly and see; some resent it bitterly and would like to prevent Senate confirmation. But apparently most want the Authority given a chance. The members and Administrator of the Authority are earnestly determined to make good.

If they don't, here's the payoff. Those not so well pleased with the setup point out that aviation got this major overhaul by taking its case through Congress to the public. This is no longer an obscure and confused industry on which another "cancellation" could be imposed even by a popular President. Aviation's importance in national life, especially in defense, is growing like a beanstalk. Government fumbling during the past ten years was natural and unavoidable. But any more of it will bring another appeal to the public and another housecleaning.

"Beware of ax-grinders!", those who would like to have seen one or more technical men on the board, say. The "tenderwing" members appointed will have trouble for a while distinguishing between sound advice and sales talk by interests who will naturally seek advantages. On the other hand, an Authority packed with air veterans might have been tempted to dish out for old friends.

The Mystic Order. Supporters of the new regime say that too long aviation has been a clique of guys who thought no outsider could possibly understand why the right wing goes down when you push the stick that way. They contend these appointees can catch onto the rudiments of the art and the business all right. Air transport is flying about 1,500,000 passengers a year after ten years of promotion, a handfull to be sneezed at. Maybe a man who can sell mints with holes is just what the industry needs.

CAA's Job Sheet, as some visiting air transport heads would write it: First, let the Authority put all its time on issuance of certificates under the grandfather provision. Second, while that is being done, let there be quiet on the battle front for new routes while everybody thinks up proof or disproof of the convenience and necessity of their pet projects; several months armistice would be very welcome. Third, but meanwhile, let the Authority consider "equitable", meaning higher air mail rates. They believe the Post Office is really two or three million dollars in the black with postage revenues over payments to carriers, and they would remind the public that it is subsidizing the PO and not air transport.

Airlines are entitled to more PO money, they say, because most of them are in the red; because while getting into the red they have developed an important arm of national defense; because commercial operations have contributed far more technical advancement than have the Services which are not driven ahead by the profit motive; because air mail service is highly marketable at self-sustaining rates.

Easy lessons in bookkeeping might be offered to the government if it persists too long in holding down the rates on air mail. Washington, some carriers feel, is inclined to think that another piece of cargo, more or less, doesn't matter "because they gotta make the trip anyway." Some operators already have in mind the possibility of stepping back to special mail planes with pilots on chutes and going through on schedule. This would prevent piling up equipment at terminals in bad weather and would improve the service. The planes would be cheaper, minus plushbottom for passengers, but such air mail service would cost a passel more than the present kind, and Uncle Sam could read the statement.

Big ship cycle will soon hit top dead center, say same brass helmets here. The DC-4 is the last word for the present in engineering and nifty travel for the moneyed folks. But traffic men are pondering the fact that the bulk of rail travel is casual—people going to see Aunt Martha; while the bulk of air

A GREAT DAY FOR THE IRISH: Denis Mulligan and Douglas Corrigan discuss a small matter called the Civil Air Regulations. Already Denis had inflicted the horendous penalties upon Douglas of not being allowed to fly his clipper home from Ireland and of not flying a plane while on board the S.S. Manhattan. August 11 Douglas called sheepishly on Denis. Denis: "What about explaining your conduct?" Douglas: "There's nothing much to explain, except that I flew on the wrong end of the needle of the compass and got to Ireland instead of California." Denis: "Are you certain?" Douglas: "Yes and I'm awfully ashamed. I certainly expected some worse punishment than suspension of my license. I thought you'd give it to me when I got back here." Denis: "Douglas Corrigan, your flight has had a tremendous effect on the world." Douglas: "Well, it wouldn't do for every kid in America to jump in any old crate and go flying off."

travel is regular business trippers with plenty of their own or somebody's money to spend. Air transport would like to share part of that casual volume. Even more, it would like to increase its present microscropic share of the nation's five billion dollar annual vacation budget. Air buses might be the thing, less some expensive speed and elegant service. Airline competition, not public demand, caused these costly items.

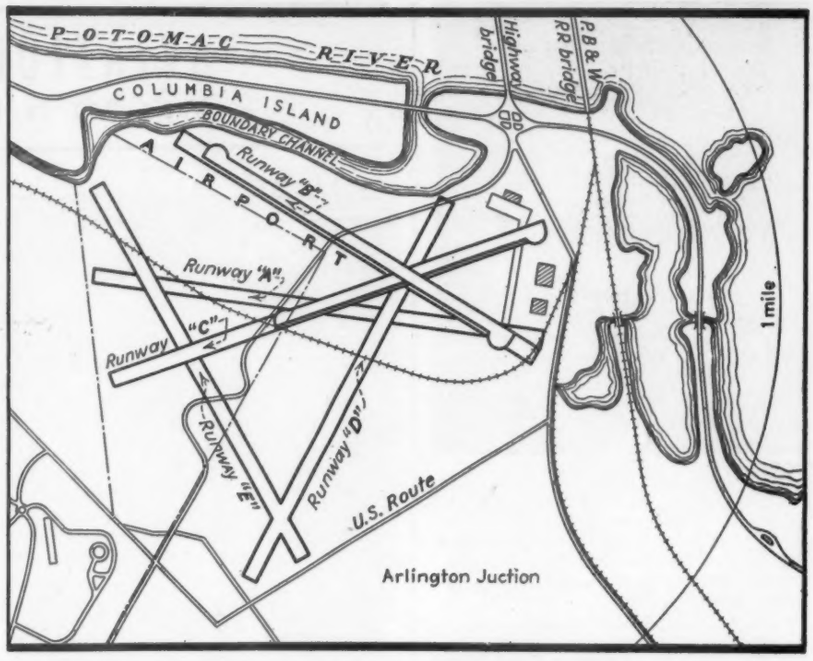
Expect more about free passes. Legislators and operators may have thought they solved that problem. But some of our best finaglers have already made excellent progress on run-arounds for deadheads. For example: airlines give free travel to chamber of commerce executives along the way. Now these energetic lads, instead of asking for free tickets, will say, in effect, "Just raise your annual contribution to the chamber, and we will buy your tickets with the difference, see?"

Moving into the Commerce Building amid spooks of unhappy bygones is not so good and CAA knows it. But in this Klondike of borrowed gold there was no other shelter to be had. The Authority plans to remodel an old apartment or other building and move away by itself as soon as possible. Then some day it will get a marble palace of its own. "The Civil Aeronautics Building ought to be modernistic," remarked one of our most able investigators, as he gazed from the Washington Hotel over the Capital's Greek temples shimmering in the heat.

Airports are still overcast. Authors of the civil air law omitted the "except airports" provision in setting up authority over airways and facilities. It would seem the Authority can, if it chooses, spend out of its appropriations for port construction, improvement, or equipment. Of course it won't. It will go ahead with the national survey, as authorized. Mr. Hinckley is reported inclined toward spending federal money on extensive development. But many interested groups are not yet sure how the responsibility divides up, and would like to see careful progress. Contention that new airplanes will take all outdoors on the ground has quieted down a bit.

The civil air law authorizes the Authority to approve expenditure of federal funds on civil airports (meaning WPA money) at the same time it authorizes the survey. This seems to be a devious means chosen by the authors of the act to leave the vital airport question open for a while, rather than submit it to a fight in Congress too soon.

Washington isn't hearing so much just now about big new airplanes that will need all outdoors on the ground. But the airport experts point out that it was the $90,000,000 spent by the government on airports that made possible the operation of the big ships of today. And, that if we are to have air system expansion under the lew law, it will take more of the same.



THERE IS A PLAN AFOOT: One of the first projects facing the CAA is what to do about the Washington Airport. Several alternate sites for a new field have been proposed but many people, including a large group of air line pilots, favor further development of the present Washington-Hoover site. Above drawing shows how a new runway pattern could be superimposed on the present field. All are approximately 5,000 feet long, and an extensive survey has indicated that all approaches are clear.

C.A.A. Takes Over From B.A.C.

Pledges "hard work"; appoints Frizzell and Guthrie

THE NEW CIVIL AERONAUTICS AUTHORITY lit running last month. The C.A.A. Act did not legally go into effect until Aug. 22, 60 days after final signature by the President. But by late July all the members were on hand in Washington, finding quarters in the Commerce Building, getting acquainted with each other, with their job and with some of the 3,000 employees they will take over from the B.A.C. and I.C.C. On Aug. 8, the Chairman, Vice-Chairman, members and Administrator met in the waiting room of Sec'y Roper's office and were sworn in by Judge Harold M. Stephens of the District Court of Appeals. "History would look back", he said, "upon the inception of a very great regulatory body". Chairman Alfred J. Noble replied briefly and promised, "study, hard work and application".

Next day the new commission held its first meeting and appointed Paul J. Frizzell, deputy general manager of the Home Owners Loan Corporation, as Secretary and Charles Stuart Guthrie, assistant general counsel of the Securities and Exchange Commission, as General Counsel. Frizzell, during the War passed through M.I.T. ground school, was commissioned an Ensign and took flying instruction.

Meanwhile, indications were the Authority intended to have all decks cleared for action on "certificates of public convenience and necessity" for present operators as soon as the Act went into effect. Also rumor had it, one of the Commission's first actions will take the form of a "cease and desist" order against all air line scrip books. Under the Act all special and discriminatory rates are expressly forbidden. Whether the lines can show that scrip books are neither of those awful things remains to be seen. Opinion in the industry seems to be about equally divided.

Dropping down to the N.A.C.A. for a visit, digging into the really colossal job ahead of them, interviewing a line of applicants for jobs that stretched clear to Baltimore, the Authority made what looked to some observers like one unfortunate mistake. While Washington was giving Corrigan a "dignified" reception, Oswald Ryan, Authority member, had the young ocean-crosser in for a social breakfast—and presumably for a good laugh together at those stupid old Civil Air Regulations. As Bob Osborn's Intrepid Aviator would put it, "Who ever heard of an Irishman named Oswald anyway?"

AVIATION PEOPLE

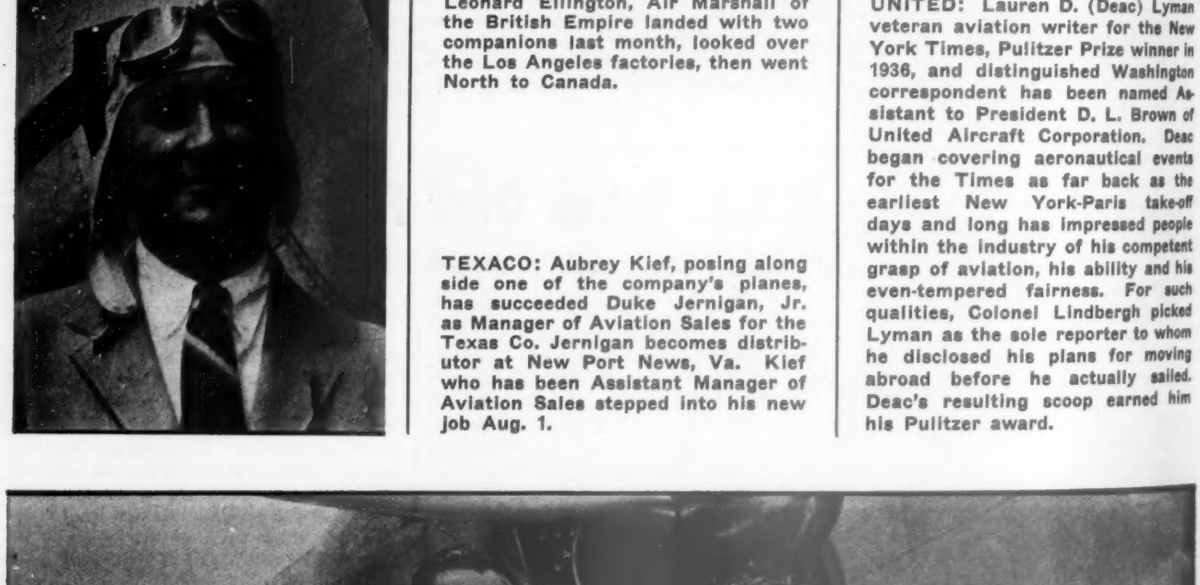
Who's Who in This Month's News

UNITWIN: Mac Short, President of Vega Airplane, says first flight tests of the two-Menasco-engines-on-one-prop idea were highly successful and Vega production will start soon. Short was long manager of Stearman Aircraft.

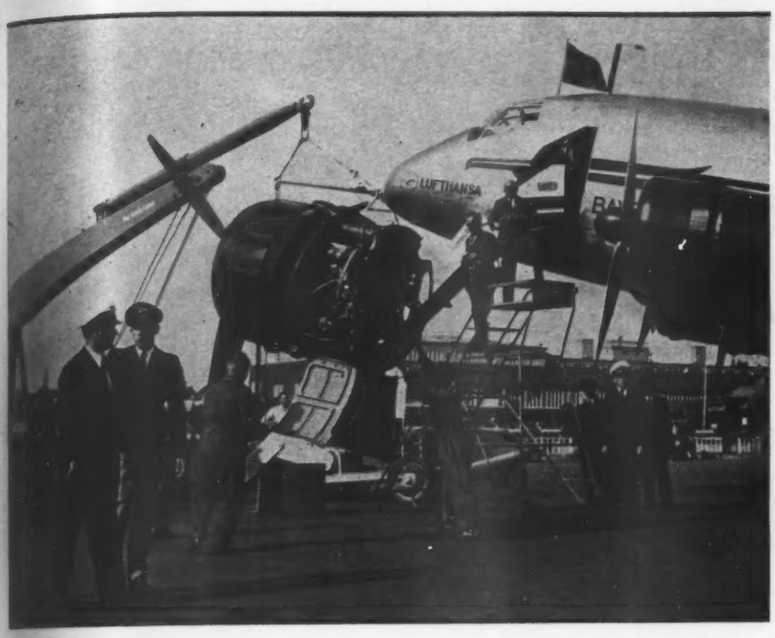
TEXACO: Aubrey Kief, posing along side one of the company's planes, has succeeded Duke Jernigan, Jr. as Manager of Aviation Sales for the Texas Co. Jernigan becomes distributor at New Port News, Va. Kief who has been Assistant Manager of Aviation Sales stepped into his new job Aug. 1.

EMPIRE DEFENSE: Sir Edward Leonard Ellington, Air Marshall of the British Empire landed with two companions last month, looked over the Los Angeles factories, then went North to Canada.

UNITED: Lauren D. (Deac) Lyman veteran aviation writer for the New York Times, Pulitzer Prize winner in 1936, and distinguished Washington correspondent has been named Assistant to President D. L. Brown of United Aircraft Corporation. Deac began covering aeronautical events for the Times as far back as the earliest New York-Paris take-off days and long has impressed people within the industry of his competent grasp of aviation, his ability and his even-tempered fairness. For such qualities, Colonel Lindbergh picked Lyman as the sole reporter to whom he disclosed his plans for moving abroad before he actually sailed. Deac's resulting scoop earned him his Pulitzer award.



MAYO MASK: To test a new oxygen mask devised by a young Mayo Clinic doctor these men and six others rode a chartered Northwest Air Lines plane across the country from Minneapolis to Los Angeles. Despite "substratosphere" levels each moved freely about—tied to the oxygen supply thru long flexible tubes. Left to Right—Mal Freeburg, pilot; Dr. William Lovelace, the inventor; Mel Swanson and B. F. Ritchie, co-pilots.



European

THE GERMAN WAY: Templehof tackles problems raised by the size of its big 4-engined Junkers-90 Lufthansa transports. At the left an auto-crane lifts an engine out of the "Grossraum." Above a small belt conveyor loads cargo into the "Grosse Dessauer"

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

German ocean planes grow wheels

The Germans aren't going to sink any more money in catapult equipment—they figure that for the next few years anyway it will be landplanes for overwater mail and flying boats for passengers, with landplanes probably taking over the whole thing later. They may get their Do. 26 boats on the North Atlantic this fall, but the big load of the survey flying will be catapulted. By next year they intend to replace the catapulted South American mail by landplanes (most likely Focke-Wulf Condors) helped out by boats if they add a passenger service.

The French aren't planning to do any more this year in the North Atlantic than keep their feet in the door by a few flights with their old Latecoere boat and maybe a landplane crossing or so. What they're aiming for is to catch up next year by having some big boats ready for real service. After a lot of arguments and delays the Air Ministry finally got around to ordering them. Fairly complete dope is out on one—the S.E. 200. It will gross about half again as much as the Boeing 314, and will be lugged around by six 1500 hp. motors. The motors they're planning to use don't turn out anywhere near that now, but the French are hoping they will by the time the boat's out. There's nothing very remarkable about the ship—it has a double rudder tail and wing floats. Inside arrangements show two decks for most of the length, with passenger quarters on both (including two showers). Meanwhile Air France Transatlantique has its dream pigeons too—Breguet and Amiot have some whoppers on their boards, but there's not much chance of their going beyond the paper stage for a long time.

9,000 Civil Air Guards are to be turned out in the next three years in England under a new scheme for subsidizing flying clubs. All clubs will get $250 per Civil Air Guard trained, plus $75 a year for everyone who keeps his license up. In exchange they are liable for immediate service in the R.A.F. or any other government air activity in a national emergency. The offer is good for both men and women between 18 and 50 . . . After a lot of mixups the Air Ministry and the Canadian Gov't have got together on setting up schools in Canada to feed the R.A.F. The deal hung fire a long time because the Canadians were afraid the R.A.F. wanted to start up its own schools and run the show, but it was finally worked out that the schools would come under the Canadian air force. The schools will use the same methods and equipment as the R.A.F. and students will go on to England for advanced training. Heavy bombers will probably be the first type turned out in Canada for the R.A.F.; another one of those missions is now over there dickering with Canadian manufacturers. The more optimistic boys figure the ships might be flown over to England.

Twin engined pursuits are going to play a big part in the new French air force. Both the Potez 63 and Breguet 690 are in production, and enough have been turned out already to get up a few squadrons. The French claim these three-seaters are as fast and maneuverable as single-seat fighters, and that a pursuit pilot is busy enough flying his ship without taking care of a radio, trying to hit someone out in front, and keeping someone else from sneaking up in back. Hot light bombers hitting around 300 mph. like the Amiot 370 and Leo-45 are also filling the factories, with heavy bombers taking a back seat . . . That Dutch Koolhoven F.K. 55 fighter that caused so much excitement at last year's Parish Show with its two oppositely rotating tractor props driven through a shaft by a motor stuck behind the pilot is now out and flying. Except for using the above scheme the present version doesn't look much like the hotter-than-hot mock-up at the show. Evidently Mynheer Koolhoven had enough troubles getting his transmission to work without tackling a trick airplane to go with it. The present ship is a pretty conventional looking high wing monoplane with fixed landing gear. The idea behind it is an attempt to give the pilot a lot of visibil-

She set a National Non-Stop Record flying from Chicago to Hornell, N.Y.!

IN 1912 Ruth Law, one of the first American women to hold a pilot's license, was forced down at Hornell, N.Y., in an attempted non-stop flight from Chicago to New York City. Though she didn't reach her goal until the following day, that 600-mile flight to Hornell set a national non-stop record!

Today transcontinental flights are made in *hours*—and the distance is many times greater than Ruth Law's record.

What is it that gives aviation this ability to keep moving forward? Isn't there a limit to speed, altitude, distance and endurance records? No—not unless it is possible to believe a limit can be reached in improvements of fuels and engines; and that, no engineer will admit. For it is through refinements in engine and gasoline that aviation will progress—that new records will continue to be made.

Working daily for further fuel and engine development, Ethyl engineers are aiding aviation engineers in research. Their program is as ambitious and limitless as flying records themselves. Ethyl Gasoline Corporation, Chrysler Building, New York, N. Y.

ity (he sits way up front in a greenhouse right behind the props) and also gets as much maneuverability as possible by bringing the mass of the motor in close to the center and getting rid of torque by using oppositely rotating propellers. The 860 hp. Lorraine motor and the gearing got lost in the shuffle during the current French armament crisis, but now that the contraption is put together and flying, Koolhoven may turn up yet with something with the super performance predicted at the Paris Show.

Jailhouse engineering must be an old Russian custom. Their I-5 pursuit was turned out by Polycarpoff and Grigorovitch while in the hoosegow over politics. Now there are stories that Tupoleff, their prize designer and head of the Aero-Hydrodynamic Institute, wasn't really liquidated when he dropped out of sight a few months ago. He's supposed to be laid away somewhere quiet and may be allowed to bail himself out with his sliderule.

Sovoia competition may give American exporters something to think about. Their new S.M. 83 lays into the medium size, high speed class that used to be pretty clear except for U.S. products. It's a 14-passenger trimotor with 2,340 hp. that cruises around 240 mph. at 60 per cent power. It's pretty hot stuff, landing over 70 mph. in spite of Handley-Page slots and slotted flaps. Sabena has taken three of them for their run to the Belgian Congo, and has given them a big boost by breaking records all around on the European runs they've been temporarily used on. . . . H. Pillichody and E. Amstutz, director and technical advisor of Swissair, are back from a junket to look over the big ships now coming out in the U.S.

80,000 route miles on which the sun never sets have the English feeling pretty proud. In 1937 these lines flew about 11,000,000 airplane miles (U.S.—77,000,000) and about 50,000,000 passenger miles (U.S.—550,000,000). The Empire boasted 3,140 registered aircraft, around 2,000 commercial and 7,500 private pilots. This last isn't very far behind the U.S. figure, and checked against about a third as many planes shows the importance of the subsidized clubs in British private flying. . . . 608 planes were exported; about half went inside the Empire.

The average Dutchman is going to fly where he now takes the train if K.L.M.'s summer program succeeds. They've laid down a network of lines inside Holland that hits all the vacation spots, knocked fares down around second class rail rates, and boosted baggage limits. Through a tieup with the Royal Netherland Travel Association, their members can ride at less than 5c a mile. It's an interesting experiment in trying to squeeze big traffic out of a country a short jump across by getting Momma, Poppa, and the kids used to flying when they go to see Aunt Tillie.

LET'S TALK BUSINESS

Ranger Engineering Corp., Farmingdale, N. Y. announces the appointment of Pacific Airmotive as its authorized service and overhaul station for the West Coast territory. Parts stock and equipment at Burbank and San Francisco make complete Ranger engine service available at both Airmotive branches.

The Norma-Hoffman Bearings Corp., Stamford, Conn. has completed an extension to its buildings and has placed substantial orders for new machine tool equipment.

John A. Roebling's Sons Co. announces the establishment of a branch office and warehouse at 855 North Ave., West Pittsburgh, Pa. A full stock of wire rope and insulated cable will be carried.

Brewster Aeronautical Corp. announces the creation of a new separate division to be known as Brewster Aircraft Parts. P. M. Stephenson has been elected Vice President in charge of the new division which will specialize in parts work not only for the parent corporation but for other manufacturers as well. He has been with Brewster Aeronautical since 1932 as production manager. Temple Joyce remains Vice President in charge of Brewster Airplanes formed last October.

E. Burke Wilford, President of the Pennsylvania Aircraft Syndicate of Philadelphia, and Frank G. Diffin of New York, announce the formation in Delaware of Cooper-Wilford Beryllium, Ltd. organized principally for the purpose of bringing Beryllium into aircraft and engine manufacturing. It is capitalized at $100,000. Other members of the organizing syndicate are: James Work and Temple Joyce of Brewster Aeronautical Corp., Brooks B. Parker, aviation insurance expert of Philadelphia, Victor Zelov, President of Molded Products, Inc., Dr. Zorvkin, Chief of Television Research Radio Corporation of America, and Sir Gordon Ley of England.

The company is primarily a patent holding and research organization. A production company will be formed about January 1st, 1939. Secretary is Ralph G. Albrecht, 501 Fifth Ave., New York City.

Spurred to record speed by an all-time high backlog which stood at $21,300,000 on June 30th, Lockheed Aircraft Corporation airplane production set a new monthly mark in June with the delivery of fourteen all-metal transports with a net value of $1,079,000. This represented a 158 per cent increase over the same month a year ago. Deliveries for the full six months ended June 30th totaled $4,700,000, a gain of 80 per cent over deliveries for the corresponding 1937 period. Among recent deliveries of Lockheed planes were listed four Model 14 transports for Liniile Aerienne Romane Exploatate Cu Statul, leading Roumanian airline, and the twenty-first and twenty-second of a 25-plane order for Japan.

News of new Lockheed orders continues to pour in. Latest were two Lockheed Electras to the Jugoslavian air line "Societe de Navigation Aerienne Yugoslave"; and two Lockheed Electras for MacRobertson-Miller Aviation Corporation, Ltd., Northwest Australia, for service between Perth, Western Australia, and Darwin, on the north coast. The Jugoslav order marks the third purchase of Lockheed equipment by this firm. The first order, for two Electras, was filled in April, 1937, and a second order for three more planes of this type was delivered early this year to Belgrade, headquarters of the line. The Jugoslavian Lockheeds are operated between Belgrade and Vienna.

Beech Aircraft reports orders for Beechcraft biplanes and Beechcraft all-metal twin-engined monoplanes to be shipped to Brazil, India, the Philippine Islands, and an undisclosed oriental country. The addition of India to the list of countries to which Beechcrafts are going, brings to twenty-two the total number of countries which have Beechcraft. The Indian shipment comprises three Beechcraft for the Indian National Airways for mail and passenger transportation between Karachi and Lahore. The factory at Wichita, Kansas, is operating on a two-shift basis.

Gillies Aviation Corp. of Hicksville, N. Y., announces eight orders since January 1st for the Grumann "G-21A" Amphibian. Purchasers include McIntyre Porcupine Mines, Ltd., of Toronto, Canada; J. J. Ryan, New York sportsman; Lloyd Aereo Boliviano of Cochabamba, Bolivia; the Department of National Defence of the Dominion of Canada; Gar Wood of Detroit, who reordered after losing his first "G-21A" in the Miami hangar fire in April; the Texas Company; K. L. M.; C. V. Whitney, Chairman of the Board of Directors of Pan-American Airways; and Nevada Explorations Corporation of San Francisco. In addition the Grumman Aircraft Engineering Corporation is building twenty-six "G-21A" amphibians for the United States Army and one for the United States Navy.

Fairchild Aviation Corp. announced unfilled orders at June 30 of $1,530,014, against $1,363,738 on January 1, and $1,341,410 on June 30, 1937. President James S. Ogsbury stated, "business on the books of the camera division assures the normal operation of our

Jamaica plant during the remainder of 1938, with a fair amount of business carried over into 1939. The business on the books of the surveys division, while less than shown six months ago, is still sufficient to continue normal operations during the balance of this year."

Federal Judge Walter C. Lindley has granted authorization for Stearman-Hammond Aircraft Corporation, of South San Francisco, Calif., to file for reorganization under section 77B of the Federal bankruptcy laws. Bendix Aviation, Ltd., and two other firms had filed involuntary bankruptcy proceedings against the company.

Net operating income of Kinner Airplane and Motor Corp. for June was $1,357 according to Earl Herring, trustee. The company is re-organizing under section 77B of the national bankruptcy act.

Automatic Controls, Inc., has been formed in Redwood City, Calif., by A. Baldocchi, to manufacture and market a new system of automatic flight control soon to be announced. Satisfactory flight tests are reported to have been concluded and announcement of the device is said to await only official ATC.

Ryan Aeronautical Company took a spurt during July and August. Major order was a $100,000 contract from Lockheed for the entire exhaust manifold requirements for the Lockheed 14s being built for the British government. This order comes close on the heels of another contract almost as large for Ryan exhaust manifolds to be installed on U. S. Army bombers of an unnamed make. Ryan's aircraft manufacturing division continues to pound out the all-steel S-T and S-C monoplanes at a healthy rate. Substantial foreign orders on the STM military trainer continue to come in. The latest export shipment: six STMs to Guatemala, which followed earlier shipments of similar planes to Mexico and Honduras.

Menasco Manufacturing Company, has announced major expansion of manufacturing activities in four separate fields. While rapidly expanding production of the standard line of Menasco aircraft engines the company is equipping for production of the new "Unitwin" powerplant developed for Vega Airplane Company, Burbank, a Lockheed subsidiary. The standard line of Menasco engines include seven models ranging from 50 to 290 horsepower. The "Unitwin" powerplant combines two of the 290 h.p. "Super Buccaneer" engines into a unit assembled so as to drive a single propeller by means of a patented free-wheeling gear box. Flight tests made by the Vega Airplane Company have been promising and substantial production is scheduled.

Other Menasco activities include substantial machining contract work of a specialized nature for Lockheed, North American Aviation, and Douglas Aircraft Company. The British orders to Lockheed and North American have placed a premium on rapid production of certain machined parts and the Menasco plant is running three shifts in some departments.

Final phase of Menasco activity was announced late in July with signing of a contract involving production of one thousand Covic Diesel engines for the Northill Company, of Glendale, which holds American sales rights to this unique engine. Menasco engineers are now adapting the Covic Diesel to American production standards. Production of 100 engines per month is scheduled.

The first dividend in three years looms for shareholders of Douglas Aircraft Company. The last dividend was in 1935, when 75 cents per share was distributed. Donald Douglas, president, has announced that net profit for the first six months of the company's fiscal year was equal to $1.91 per share. Earnings for the full year are estmiated at between $3 and $4 per share, depending on the charge-off policy applied to the cost of the DC-4, which is now undergoing flight tests. It is believed that final decision on declaration of a dividend may be deferred to the end of the fiscal year, November 30.

In the meantime Douglas officials continue to hold off the NLRB. Following recent withdrawal of the National Labor Relations Board order to Douglas to reinstate forty-five C.I.O. sit-down strikers, eleven of whom had been convicted of trespass, the board began a new open hearing in Washington August 18th.

Dycer Aviation Supplies, a new name in the aircraft used parts business, is operated by Edward A. Dycer (formerly manager of Dycer Airport) with a new location in South Los Angeles, where a show room has been arranged for the display of all classes of aircraft and engine supplies.

FAR FROM HOME: Three Ryan S-T-M Military Trainers land at Guatemala City for gas on the long flight from San Diego to Tegucigalpa, Honduras where they will be used for training purposes by the Honduran Air Force.

PROFITS AND LOSSES

» AVIATION CORP. and subsidiaries for six months ending May 31, a net profit of $388,993 equal to 14 cents a share compared with a net loss of $143,156 during the corresponding period in 1931.

» BEECH AIRCRAFT for the nine months ending June 30, a net loss of $31,197.65.

» CURTISS-WRIGHT CORP. a net profit for the June quarter of $1,447,951 equal to twelve cents a share. Profits for the first half of 1938 total $2,181,862 equal to fourteen cents a share. Wright Aeronautical's share of the profits was $1,081,958 for the second quarter and $1,668,246 for the first half.

» DALCO, INC., Los Angeles aircraft equipment manufacturer, a 12 per cent per annum dividend based on capitalization of $50,000. This takes effect September first to all stockholders on record as of August first. Dalco products include retractible landing lights, and special equipment for retraction of landing gears and flaps.

» NORTH AMERICAN AVIATION, INC., Inglewood, Calif., a consolidated net profit for the six months ending June 30, last, amounting to $590,175 after all charges. In addition the company received $825,603 (after provision for Federal income tax) in excess of book value on sale of its air transport division, Eastern Air Lines, which was transferred directly to capital surplus. Profit for the first six months of 1937 was $66,832. Unfilled orders as of June 30 amounted to $14,952,853, against $8,068,322 at the end of June, last year. A major expansion of factory facilities is now under way at the Inglewood plant, increasing capacity by approximately 50 per cent.

» UNITED AIRCRAFT CORP. for the quarter ended June 30, a net profit of $1,349,412.69 equivalent to 53 cents a share. Unfilled orders on hand June 30 totalled $24,074,000 compared with $23,810,000 a year previously. Total profit for the first half of 1938 amounts to $2,421,711.37.

AGAIN the United States of Brazil turns to her northern neighbor for an outstanding product to serve in more closely unifying the vast territories of this great South American Republic. ¶ The effective patrol of 4000 miles of coastline and of vast jungles, plantations and rugged plateaus which surround Brazil's industrial centers requires fast, dependable equipment. To meet these requirements the Brazilian Air Corps has selected twenty-six Vultee V-11GB2 Attack Bombers, powered with Wright Cyclone G-1820-G2 direct drive engines.

VULTEE AIRCRAFT, DOWNEY, CALIF.
Division of Aviation Manufacturing Corporation

Vultee
T. M. Reg. U. S. Pat. Off.

LOGGING THE LINES

Air Transport Drift Sights

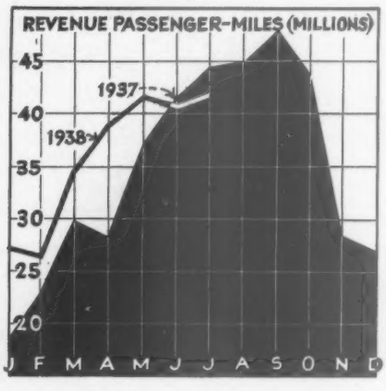
by DAN SAYRE

Traffic continues below '37 levels

We almost fell out of our chair last month when the girl who brings our mail around left us a nice little postcard. Across the back of it was the slogan, "Now Children Fly At ½ Fare" and some to-the-point copy explaining the new rates. Then down at the bottom were three signatures with insignia—American Airlines, Transcontinental & Western Air and United Air Lines. The big knock-down and drag-outers getting together on some joint selling! To top that off we heard the same week from three different sources that the lines—possibly every last one of them—will get together on joint advertising for the World's Fair business next year. And then, if that works, the boys may all go along on a permanent joint ad program. That makes the most sense to this department of anything we've heard this year.

Chicago & Southern reports an increase for the first half of this year of 48.2 per cent in revenue passengers carried over the corresponding 1937 period. The Valley Level Route also announces: That it is now air-conditioning planes on the ground at Chicago and St. Louis. That it has opened a joint ticket office at Memphis with American Airlines. That it has awarded a trophy and certificate to its foreman of engine overhaul, James Seybold, as "America's No. 1 Spic and Span Mechanic."

Tri-State Aviation Corp. has the inside track on those experimental air mail bids called for by the Post Office which will be opened Sept. 15. Tri-State, of which Dr. Lytle S. Adams is the president, has been operating since last March just such a pick-up-and-deliver-from-the-air service for express as the P. O. now wants for mail. And, of course, its present express routes from Baltimore to West Va. are not far off the Philadelphia-Pittsburgh and Pittsburgh-Clarksburg routes specified in the bid invitations. There are 24 stops listed on the first route; nine on the second and a circle out of Clarksburg to pick up 17 more towns. The bids are asked for under an appropriation of $100,000 in the last deficiency bill passed by Congress.

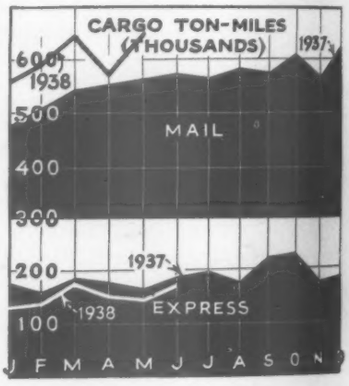


Captain Otis F. Bryan, TWA pilot, after a tour of duty with the Air Corps during which he logged 58 hours on the Corps' Y1B-17 four-engined bomber, has been named chief instructor in a "school" which will train other TWA flyers on four-engined technique—against the delivery of TWA's Boeing 307 Stratoliners . . . TWA has appointed William J. Austin of Pittsburgh "Manager of National Accounts" in the traffic department. Austin had been V. P. in charge of Penn-Central for the past several years . . . TWA revenue passenger-mileage for the first six 1938 months totaled 33,427,440. That's 20.1 per cent ahead of the same period last year.

Rub the name Hanford Airlines out of that brain of yours. The same line, the same management, the same organization will hereafter be known as Mid-Continent Airlines, Inc. By any name whatever the company is rightly pleased with current business. First quarter traffic was up 151 per cent over last year. The second quarter also showed a big improvement.

United has moved F. E. Caldwell, formerly Director of Dispatch, to the position of Assistant to the V. P. in charge of operations. Ted Johnson, formerly assistant to Caldwell has been placed under Chief Pilot R. T. Freng. Object: to consolidate all responsibilities concerning flight operations . . . United, observing the eleventh birthday of its N. Y.-Chi run, found over 40,000,000 miles in its log book for that section of its routes . . . United revenue passenger-miles for the first six months totalled 45,336,693 as against 38,459,948 for the first half of 1937. Pass-mileage in July was 11,003,486.

Two accident reports have been issued recently by the B.A.C. The first, dealing with the probable train of events



leading to TWA's crash in Yosemite last March, makes a remarkable reconstruction of the probable course of the plane and the pilot's attempts to get out of his difficulties. Well worth the study by any air line's operations man . . . The second explains Northwest's accident July 8 at Billings: The plane left the ground in a stalled position. The pilot tried to recover. A misplaced stop on the quadrant of the propeller-pitch control levers reduced the emergency power available. The plane fell off on the right wing and crashed 1,100 ft. beyond the end of the runway.

Western Air Express flew over 1,340,000 passenger miles on its border to border system during July, an increase of 43% over June and 17% over July, 1937, according to Alvin D. Adams, president. More than 4,100 passengers were carried in the month of July, an increase of 38% over June and 21% over July a year ago. Air mail poundage increased 8% for a new high total of 75,000 lbs. Adams attributed the substantial traffic

AIR TRANSPORT INDICATOR

August 1, 1938

92.7

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during July 1938, to the corresponding figure for July, 1937.

For the second time in seven months the Indicator stands at under 100. First seven months totals: 1937—218,743,476; 1938—250,362,034, up 14.4 per cent.

increases to a general improvement in business conditions, heavy summer vacation travel, and improved Western Air Express airport facilities in the vicinity of the Yellowstone and Glacier National Parks.

AIRLINE INTERVIEWS

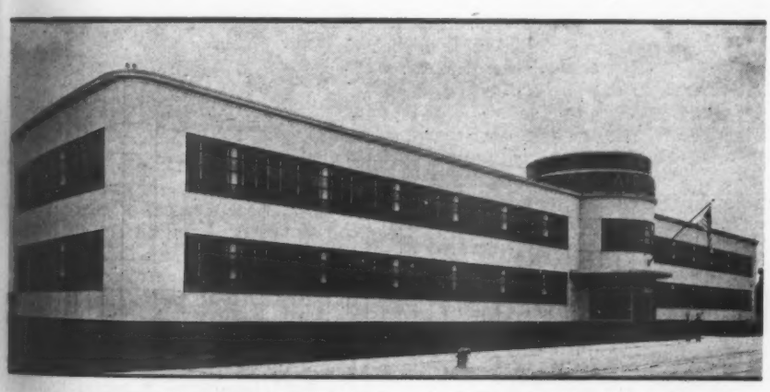
WE HAD LOOKED UP "Maitre d'Air Line" in our best French dictionary and as near as we could make out United had given Don Magarrell the title of Headwaiter. That seemed something a little hard to be for an airline. When Miss Strugglebump, R.N., spilled soup on a lady over Sandusky, what did Magarrell do—scold her by radio? . . . Gosh, No. Magarrell hastens to explain, That Maitre title was just some press agent's gag . . . He'd much prefer Chief Steward or Superintendent of the Commissary. In the Fall of 1936, he'd been called in to study United's whole food problem, had made two recommendations and more or less been challenged to work them out himself . . . He'd taken off his hat and coat and hadn't stopped working since . . .

The two recommendations? Well, the first had been that United should cut its food bills by $20,000 . . . And anyone who ever crossed two states on an air line could guess the second—get away from picknicky meals and that fried chicken which habitual air travelers claimed was making them sprout pin feathers.

The Twenty-Grand part was, it seemed, really pretty simple. Despite its huge food expenditures (United will serve 400,000 meals this year) the line was buying all its meals from local restaurants or caterers at retail prices. Magarrell simply proposed United should prepare most of its own food wholesale. By Dec. 22, 1936, he had set up a $3,600 commissary at Oakland complete with a good chef, kitchen, etc. During 1937 it saved $9,600 over the prices United had been paying. Now he had commissaries at Oakland, Chicago and Portland and was really set to make good on that twenty-grand offer. Costs would be down to about $1.43 per thousand passenger-miles this year . . .

The Better Meals Campaign got a big break right at the start. United was just changing over to DC–3's and

DON MAGARRELL is the quiet-spoken, young fellow who since Oct. 1936 has been what United Air Lines calls its Maitre D'Air Line. He's only 33 but he knows his vegetables. Born and raised around Council Bluffs, Iowa, he entered Cornell in 1924 to take the course in Hotel Administration, left almost immediately for a quicker start in his chosen field. For more than a year he hopped bells, peeled spuds, counted linen in Philadelphia and Washington hotels, then landed a job with R. M. Grinstead Co., a firm of consultants. During the next ten years, Don went from one hotel, club, hospital or steamship line to another, taking the ptomaine out of the meat-balls, pulling the commissary up out of the red ink, teaching waiters to serve the soup with only one thumb-mark. In the Fall of 1936 United Air Lines turned up as Don's 300th assignment.



United Air Lines' new $300,000 building at the Chicago Municipal Airport is air-conditioned, sound-proofed in important sectors, and beautifully lighted.

A complete kitchen delights Don Magarrell and his chefs.

An elaborate medical department includes a high-altitude chamber.

that meant more room and weight for the commissary department. For the 21-passenger day planes Magarrell put in a five drawer dry-ice icebox. Big thermos jugs kept hot foods hot. A "streamlined" lunchbox out of pressed cardboard helped speed service (present standard is three minutes per passenger) . . . On the sleepers Magarrell worked out an electrically heated stainless-steel food container lined with two inches of Balsa wood. The whole thing only weighs 38 lb.

Meanwhile the menus were getting a big overhauling. Ada Williams, dietician, and Col. Tuttle the line's chief medico helped balance up the calories. As a matter of fact, any foods digestible at sea level are all right aloft, but United menus sidestep "worry foods", foods with strong odors such as greasy foods, pork (except ham and sausage), duck, goose, odorous fish . . . But aside from those United passengers get the whole list: roast beef, roast lamb, baked ham, roast turkey, capon, chicken a la king, sea food newburg . . . By April of last year fried chicken had been completely dropped . . . So many passengers immediately asked "where's the fried chicken?", that it too is served occasionally . . . In general only the sky lounges get choice of more than one meat, but on Fridays, passengers can get sea food or . . .

The DC-4 is going to help things considerably, Magarrell's first job was to go out and keep house in the DC-4 mock-up in Santa Monica and work out suggestions. The galley's electrical allowance is going to be 4,600 watts. That will be enough to run a thermostatically controlled hot food container; enough to permit cooking eggs and bacon, heating coffee—even run a malted milk shaker.

That all sounded like the real stuff at last—did le Maitre think that then the air lines could start charging for food? Gosh, No! He hoped not. Magarrell for one is a complete believer in the no-charge-for-meals idea. Certainly, up to now it had saved the commissary departments thousands of complaints. No matter how big ships get you will never be able to carry much choice and cash customers are used to it. If you put in a charge, a lot of people won't eat and that will bring on fatigue and air sickness . . . Besides you would never more than half cover the cost of your meal anyway . . . Why not keep that big bulge over the railroads?

SCOUTING THE SQUADRONS

Notes and Comment on our Air Defenses

The Mackay Trophy for 1937 has been awarded to Captains Carl J. Crane and George V. Holloman. Bestowed each year "for the outstanding flight of the year made by an officer or officers of the U. S. Army, the Trophy in its 26 year history has gathered some of the most distinguished names in American flying. This year the board of award was unanimous in choosing Capts. Crane and Holloman for their achievement, on last Aug. 23, of the first wholly automatic blind landing in aeronautical history (See AVIATION, Sept., 1937). Raymond K. Stout, project engineer at Wright Field, who was associated with Crane and Holloman in the project, received a letter of commendation for his share of the feat from Acting Secretary of War Johnson. As a civilian, he was not eligible for the Trophy itself.

The Navy's Medal of Honor for extraordinary heroism in the line of duty has been awarded to the late Lieut. Carlton B. Hutchins, killed in a collision between two patrol planes during fleet exercises Feb. 2, 1938. "Although his plane was badly damaged, Lieutenant Hutchins remained at the controls endeavoring to bring the damaged plane to a safe landing and to afford an opportunity for his crew to escape by parachutes. His cool, calculated conduct contributed principally to the saving of the lives of all who survived."

The Navy is pretty proud of the "pioneering" it has done at the fourth and newest Fleet Air Base at Sitka, Alaska, (others are at Pearl Harbor, San Diego and Coco Solo). With few funds available, Navy personnel converted an abandoned warehouse into barracks, blasted a turn-table out of bed rock and otherwise "hand-labored a wartime radio and coaling station on Japonski Island into a workable air base for six patrol planes.

Military flying along the Pacific Coast has expanded under the warming influence of the summer sun. Forty-four Consolidated PBY patrol planes returned to the San Diego Naval Air Station on August 1 after a 1,025 mile non-stop flight from Seatle which concluded summer exercises taking the group as far north as Sitka and Kodiak, Alaska. The group originally left San Diego June 25th, making a non-stop flight to Sand Point air station, Lake Washington, Seattle. The forty-four planes comprise Patrol Wing One of the Scouting Force, under Capt. Alva D. Bernard, and carry a complement of approximately eighty officers and 200 men.

Other major Navy flight activity has included extended off-shore maneuvers of two hundred and forty fighting, scouting, bombing and long range planes under the command of Vice-Admiral Ernest J. King, and Rear-Admiral Charles A. Blakely.

Not to be outdone by the Navy, thirty-three bombing and attack planes left the Army base at March Field, Riverside, early in August, for a week-long period of training in conjunction with a similar number of planes from Hamilton Field, San Francisco, in the Pacific Northwest, near Spokane.

Fragmentations: Ever since the Navy set up its Aviation Cadet Program, there has been a deal of confusion over the status of Aviation Cadets attached to the fleet for active duty—Were they officers or were they men? Now a ruling clears that up. They are to be considered "officers in a qualified sense"—just like midshipmen . . . Chalk up one more accomplishment for the B-17 bombers—A round trip from Langley to Bogota, Colombia (non-stop from Miami under command Maj. Vincent J. Meloy; Maj. Harold L. George and Maj. Caleb V. Haynes . . . Start a new list of spectacularities for the Seversky P-35 pursuit—A flight by Lieut. H. L. Neely from Hamilton Field (near San Francisco) to Mitchell Field, Long Island, in 9 hrs. and 55 min. flying time. Refuelling stops at Salt Lake City, Omaha and Cleveland totalled another 70 minutes. . . .

UNDERNEATH THE PALMS: Patterson Field lines up five YG-1B Kellett giros. The Pilots are graduates of autogiro schools conducted at that field. These and similar ships are undergoing extensive field tests with ground troops.

The HYDROMATIC *propeller...*

THE shining dome of the new HYDROMATIC quick-feathering propeller has already become a familiar sight in American aviation. Five major United States air lines have either installed it as regular equipment, or have entered production orders.

Only the Hydromatic propeller offers: (1) a quick-feathering action; (2) a principle of operation utilizing the fundamental forces of oil pressure and centrifugal moments; (3) a complete system of pressure lubrication; (4) a basic type of construction that has been proven structurally sound during millions of service hours.

HAMILTON STANDARD PROPELLERS

ONE OF THE FOUR DIVISIONS OF

UNITED AIRCRAFT CORPORATION

EAST HARTFORD, CONNECTICUT

AVIATION'S OPERATORS CORNER

Tagging the Bases with

LES NEVILLE

Prairie Airways Gets Canadian Feeder Contract

FIRST CANADA FEEDER LINE CONTRACT was let recently to Prairie Airways, Ltd., with head offices in Moose Jaw, Saskatchewan. The route will extend from Prince Albert to North Battleford, south to Saskatoon and Moose Jaw, connecting with Trans-Canada at Regina. When operation of the line is well under way, it is expected that similar feeder routes will be established under the supervision of the Canadian Post Office Department to tie in with Trans-Canada Airlines.

The low bid of Prarie Airways, Ltd., was based on the economy of bi-motored Model 18D Beechcraft monoplanes. The identical ships were delivered to Prairie Airways in July, and a third probably will be added when the line gets into operation. Delivery of the two ships was accepted at the Beech Aircraft factory in Wichita, by R. W. Ryan, general manager of Prarie Airways. The transports were flown into Canada, one at a time, by M. V. Gillard, chief pilot of Prairie Airways, the first leaving the factory on July 9 and the sister ship taking off July 16. The ships were purchased through Aircraft Industries Ltd., of Montreal, exclusive Canadian Beechcraft distributors.

The interiors of the planes have accommodations for seven passengers and two pilots, and are luxuriously finished throughout in a medium shade of blue. All proven safety devices and features of comfort have been incorporated in the twin ships. Complete soundproofing, soft comfortable chairs, and perfected ventilation are provided. Ordinary room temperatures can be easily maintained when the outside air temperature is —30°F.

Improved stability in a stall is created by a built-in twist or warp of the wings from the roots to the tips, reaching a maximum washout of 3½ degrees, which prevents the entire wing from stalling at the same instant. Float fittings have been installed for the attachment of floats for service on water. Likewise, the planes are equipped with ski gears for winter operation.

Fully loaded, the Prairie Airways ships powered with the 330 hp. Jacobs L-6 engines have a landing speed of less than 55 m.p.h. and will take off, with a run of only 500 feet. The ships have a cruising speed of 195 m.p.h. at 9,600 feet, and yet will use less than 35 gallons of gasoline per hour. The planes will cruise at 125 miles per hour with one motor, using only 75 per cent power output from the live motor. It is an interesting fact that the bi-motored Beechcraft can continue takeoff if one of the motors fails to function, providing a speed of 50 miles per hour on the ground has been attained.

R. W. Ryan, General Manager

The engine is a heavy-duty unsupercharged type, rated at 300 hp. at 3700 feet altitude at 2000 revolutions per minute with available power for takeoff of 330 hp. at 2200 revolutions per minute at 26 inches of mercury manifold pressure. The available emergency power output of the engine is more than 350 hp. A 914 cubic inch piston displacement enables high torque to be developed and produces rated power at comparatively low revolutions per minute and low manifold pressure.

For these details we are indebted to S. M. Patton of the Beech Company.

The NAA and Private Flyers Association announce an agreement under which PFA secures representation of NAA's 9932 members in private flying matters. New governors of PFA are Ninety-Nine President Mrs. Daisy Kirkpatrick, NAA Secretary William R. Enyart, NAA Executive Committeeman James Webb, and Aero Chamber Vice President Charles E. Parker.

Pity the poor working girl no longer for she is going to have a flying club all her own. Starting in New York, but hoping to spread all over the country, Skygirls Inc. has just been organized through the efforts of Nancy Schwartz (president) and a group of other working gals including Virginia Truhaft (vice-president), Alice Nephew (secretary and treasurer), and Cynthia Chapman (recording secretary). Crystal Mowry, who holds a lot of feminine flying records, will do the instructing. After an initiation fee of $10, flying

WORKING GIRLS: Nancy Schwartz and Crystal Mowry plan to bring flight instruction to the downtrodden ladies who have to work for a living.

time will be available at a nominal fee with ground instruction thrown in. One of the new 50 hp. Piper Cubs will be used. Opportunities to earn flying time will be provided. If interested get in touch with Nancy at Dermetics Inc., Room 230, 630 Fifth Avenue, New York.

Joe Plosser's "Plosserville Gazette" tells us that a new blue and cream Fairchild 24 (Warner) has been added to the fleet. It also reports that a Menasco powered Aeronca 50 made its appearance at Plosserville recently and has attracted much attention.

Speaking of the Aeronca "Chief" (50 hp. series), an assembly plant for this model has been established in Copenhagen, Denmark. Operator will be Louis A. Erlind and Aage Reedtz, general manager of ERA Corporation of Copenhagen. Early in July the first of five Franklin powered "Chiefs" left Cincinnati for Copenhagen.

Four full days of model flying constituted the Eleventh National Championship Model Meet held recently in Detroit under the sponsorship of the local Exchange Club. A strenuous program of contests were carried out under the supervision of H. M. Hellison and Arthur J. Vhay and business management details were under the direction of Veteran Model Aeronautics Promoter Irwin S. Polk.

FOR BIG ENGINES: This cable suspended type test stand for high output engines has been completed by the Pacific Airmotive Corporation at Burbank, Calif. It is the only installation of its kind on the coast.

ENGINES BY AIR: Carl J. Friedlander (left) Aeronca Vice President, receives the first 50 hp. Lycoming engine, delivered by airplane by R. E. Palmer (right) of Aviation Manufacturing Corporation. This type of engine will power the new Aeronca "Chief."

HEADS NON-SCHEDULED OPERATORS: C. F. Lienesch, veteran California pilot is now president of Non-Scheduled Aviation, Inc.

C. F. Lienesch, veteran California pilot and present president of the Southern California Chapter of the National Aeronautic Association, was elected president of Non-Scheduled Aviation, Inc., at a board of directors meeting August 4th. Other officers elected included: Edward A. Dycer, vice president for school operators, Judge B. Rey Schauer, vice president for private aircraft owners; Cecil C. Meadows, vice president for San Joaquin Valley area; P. L. McMullen, vice president for San Francisco Bay area; Doug Kelley, vice president for San Diego area; K. C. Hawkins, secretary; Bertrand Rhine, treasurer.

Several hundred membership applications were reported on hand as the first slate of officers was sworn in, and an immediate goal of one thousand members was announced as first objective in the organization's campaign to unify non schedule aviation interests. A number of committees were appointed to undertake special work in various fields, including insurance and financing. An executive committee of five men was named to act for the board of directors; this committee consisting of: C. F. Lienesch, E. A. Dycer, B. Rey Schauer, K. C. Hawkins and Bertrand Rhine.

New Piper Cub dealers in the New York territory are the Braman-Johnson Flying Service. Their ships are now available for demonstration and instruction at Hangar B., Roosevelt Field.

Crowds awaiting the arrival of Howard Hughes witnessed the landing of O. J. Whitney's twin motored Beechcraft following an 1,800 mile emergency flight from Sheridan, Wyo.,—flying time 10 hr., 40 min. The ship had been transformed into an air ambulance to accommodate Dr. and Mrs. Arthur Shapiro, who were seriously injured in an automobile accident near Sheridan.

Riding a high tide of Cub popularity on the Pacific Coast, Aircraft Associates, Inc., distributors in California, Arizona and Nevada for the Piper Cub; and California distributor for Rearwin Aircraft; has moved into the greatly enlarged quarters of its new home on Long Beach municipal airport. Providing ample hangar space, shop room, storage, dope room, offices, etc., the new Aircraft Associates headquarters is an excellent example of what the aircraft distributor headquarters should be like, and what a substantial business the distribution of aircraft to private flyers has become. The new headquarters building measures 110 by 140 feet and has more than 16,000 sq. ft. of floor space. In addition to distributing Cub and Rearwin planes, the Aircraft Associates organization manufactures and sells steerable tail wheel outfits applicable to practically all makes of light aircraft (See page 48). President of the company is Harvey Martin, well known pioneer pilot of Southern California. J. W. Martin is vice-president and W. R. Martin, secretary and treasurer. There are 25 dealers in the organization. Cub sales in 1937 totaled 48 and Rearwins five. During the first four months of 1938 15 new Piper Cubs have been sold and delivered.

The Lexington Kentucky Municipal Airport has been leased by the Lexington Flying Service, Inc., for a period of four years. Officers in the new corporation are Mr. J. Tyler Thomas as president and general manager, assisted by Mr. John Garst. Mr. Thomas is the former owner of the Cardinal Flying Service, which operated in Louisville. Major John C. Bennett, Jr., is vice-president, and Mr. Colin Davies is secretary and treasurer. Both Major Bennett and Mr. Davies are active in the Louisville Flying Service.

The Lexington Flying Service has greatly improved the airport and hangar. Boundary markers have been located but as yet the field is not lighted at night. They have built a small Administration Building with waiting room, office, stockroom and bed room; they also maintain service on the field at all times. Eighty octane gasoline is available.

Reports from Charleston, S. C., indicate that rapid progress is being made on the construction of the seaplane terminal facilities there. The marine railway is almost complete and the administration building construction is moving ahead rapidly. The site is on the Ashley River near the Municipal Yacht Basin.

Over at Orlando, Ed Nilson is cooking up a tenth anniversary for his airport to be held October 4, 5. Committees are headed by the Honorable S. Y. Way, airminded mayor of Orlando.

Tulsa Flying Service, Inc., has inaugurated a charter service at the Municipal Airport. Floyd Muncie is manager.

REPORT CARD

Of Air School Developments

Two new ground school courses are announced by the Piper Aircraft Corporation. One, jointly sponsored by the company and CCC Educational Director F. G. Kearse, of the Loganton, Penna., Camp, will be taught directly by members of the Piper factory staff,—Hanford Eckman, superintendent, Edward Burn, Kenneth Kress, Thomas Case, Harland Van Bortel, and three others not yet announced. Department of Commerce Inspector Joseph Horton also will give one lecture. Following a course in aircraft construction, aerodynamics, theory of engines, navigation meteorology and radio, six students will be chosen for practical training in aircraft welding at the Piper factory. The second course, not directly sponsored by the factory, is the nationwide one-year ground course begun in August by the Cub Fliers of America for members. Lessons are prepared by members of the Lock Haven Chapter who are "ranking" employees of the Piper Company. They are Engineers Edward Burn and David Long and Division Superintendents Harland Van Bortel and Richard Barber.

Dead Reckoning and Celestrial navigation classes for the airman and the mariner will be given by Weems System of Navigation, Annapolis, Md., at Fels Planitarium in Philadelphia and Hayden Planitarium in New York. The course in dead reckoning will be completed before the Christmas Holidays while the advanced course in celestial will end in the latter part of April.

More emphasis on the production problems encountered in aeronautical engineering in places in recent revisions of the engineering curriculum of the Curtiss Wright Technical Institute. Chief Engineer F. R. Shanley, of the school, states that this revision applies both to the drafting and structural branches of the engineering course, as it is essential that both the draftsman and the stress analyst be thoroughly acquainted with shop problems and other factors affecting production costs. The new heat treating furnace at Curtiss Wright Tech is now operating after a month's drying out period. Built by students, under the direction of Al Novotney who is in charge of the sheet metal shops, the furnace is 6 ft. long, 4 ft. high and 30 in. wide. Equipped with a Brown electric pyrometer control, it can attain a maximum temperature of 1200 deg. F. A post graduate course in aeronautical engineering for engineers now holding a B.S. degree is now offered.

Expansion of the engineering department of the Ryan School of Aeronautics has necessitated its removal into new and enlarged quarters in the main Ryan administration building at Lindbergh Field. Ryan Engineering School is under the direction of Stanley H. Evans, well known designer and educator in this country and abroad. In the absence of Chief Flight Instructor Paul Wilcox in Guatemala, all flight instruction at the school is under the direction of Robert Kerlinger, who is also in charge of all Ryan Aeronautical Company flight testing during Wilcox's two-month absence.

The new home study course started recently by Aeronautical Educators at Boeing Field is well underway, according to R. Palmer, president, Palmer's Airplane Brokerage. The course is to be followed by practical flight training or shop practice.

Training in the technique of spray painting and the use and care of equipment for this work is offered by the De Vilbiss Company, manufacturers of paint spray equipment. Classes lasting one week start August 1 and 29, October 3 and 31, and November 28. Special student hotel rates are available.

Spartan School occupies this attractive group of buildings at Tulsa

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Personal sales-service anywhere in the world is available to owners of Lockheed equipment. With pride, Lockheed Aircraft Corporation presents its array of outstanding representatives:

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HOLLAND, DUTCH EAST INDIES — Lindeteves-Stokvis, Amsterdam. **DENMARK, NORWAY, SWEDEN, ICELAND**—Cai Caspersen, Copenhagen. **INDIA, BURMA, AFGHANISTAN**—Govan Bros., Limited, New Delhi, India. **TURKEY**—Fuat Baban, Ankara. **UNION OF SOUTH AFRICA, PORTUGUESE EAST AFRICA**—Barlow's Motor Co., Ltd., Durban, Natal, S. A.

★ **ASIA** ★

CHINA—James W. Fisher, c/o American Eastern Aviation, Hongkong. **JAPAN**—Okura & Co., New York City and Tokio.

★ **AUSTRALIA, NEW ZEALAND, PAPUA AND MANDATED TERRITORIES** ★

Brown & Dureau, Limited, Melbourne and Wellington

★ **PHILIPPINE ISLANDS** ★

L. M. Hausman & Co., Manila.

LOCKHEED AIRCRAFT CORPORATION, BURBANK, CALIFORNIA, U. S. A.

ULTRA-HIGH IN AVIATION

Again

Western Electric leads

this time with

NEW 27A RECEIVER

for Marker Signals

The new 27A Radio Receiver—Western Electric's latest aid to air navigation—was designed by Bell Telephone Laboratories and built to meet the joint requirements of the country's major air lines.

Private planes flying the airways will need this new receiver. Operating on a frequency of 75 megacycles, it provides for indication of the cone of silence and fan type ultra-high marker transmitters now being installed by the Bureau of Air Commerce. It also provides indication for the proposed inner and outer markers for use with instrument landing systems. Individual indication of one, two or all three of these services, as required, is provided by filters in the receiver which operate respective external lights. Stabilized by quartz crystal oscillator—and is complete with a self-contained, quickly detachable power supply.

For full details write to Western Electric Company, Department 320–A, 195 Broadway, New York, N. Y.

27A RECEIVER

Bureau of Air Commerce Approval No. 141

Crystal controlled "Superhet." Operates on fixed frequency of 75 megacycles. Weighs 19.3 lbs. complete. Measures approximately 7-11/16" high, 5-3/16" wide, 19-1/2" deep.

These leading air lines have standardized on the 27A:

American Airlines
Braniff Airways
Chicago and Southern Air Lines
Continental Air Lines
Delta Air Lines
Eastern Air Lines
Hanford Airlines
Northwest Airlines
Pennsylvania Central Airlines
Transcontinental and Western Air
United Air Lines
Western Air Express

Western Electric — Northern Electric in Canada

TWO-WAY AVIATION RADIO TELEPHONE AND TELEGRAPH EQUIPMENT

3 Spots and a Horn

(*Continued from page 29*)

the blind-landing system, two of the major objections of the Bureau of Standards system are overcome. In the first place, the glide path is a straight line, and in the second place it is independent of changes in the reflecting properties of the ground surface.

In the proposed system, four beams will establish two overlapping regions, one for vertical and one for horizontal directivity. The two overlapping regions will intersect each other at right angles along a line corresponding to the landing path. All four beams will be sent on the same frequency, but each modulated with a different audio frequency. The audio frequencies are separated by filters in the receiver, individually rectified and applied to an indicator which shows whether the plane is above or below, or left or right of, the landing path. In preliminary tests, directivity will be established only in the vertical plane, a run-way localizer being used for left-or-right indications. The horns for the former purpose will be set up at the side of the run-way involved.

The theory of the horn radiator has been carefully checked by Dr. Barrow and his assistants, with a transmitter generating about 3 watts at a wavelength of 50 cms. (a frequency of 600 megacycles). This transmitter utilizes a Western Electric 316-A tube, a triode built especially for ultra-high frequency generation. The transmitter frequency is stabilized by the use of quarter-wave transmission line sections, and the output is applied to a quarter-wave doublet antenna situated in the throat of the horn structure, which is constructed of galvanized iron sheets. The apparatus was set up in a large athletic field on the grounds of the Institute. A portable field-strength measuring set, consisting of a 955 triode grid-leak detector and amplifier, was used to register the field strengths through the horizontal ground plane in front of the horn. The experimental results agree very closely with the theoretical predictions, and show definitely that the pattern assumed by the waves depends on the horn structure alone and may be made independent of ground effects. Further studies are now in progress to show the directivity in the vertical plane and to check the stability of the overlapping regions between two beams.

In addition to this testing program, work is in progress to develop a transmitter and receiver for wavelengths shorter than 100 cms. One receiver design showing great promise is a crystal-controlled superheterodyne in which the oscillator frequency is derived from a 14 Mc. quartz crystal, whose output frequency is multiplied by doubler and tripler circuits to a frequency of about 340 Mc. This frequency is then mixed with the incoming signal frequency and the difference frequency (about 4.5 Mc.) is amplified by conventional methods. An overall voltage gain estimated at about 50,000 times is obtained from antenna to second detector output, with ample stability. The band-width accepted in the intermediate frequency amplifiers, 300 kc., is sufficiently wide to allow for the observed frequency variations in the transmitter.

Further work on transmitters involves the production of somewhat higher power than that available from the test transmitter, but the power problem is not serious because of the power gain obtained through the use of the directional radiating system and because high receiver sensitivity can be attained and used. Sufficient work has been done with the transmitter and receiver to indicate that the straight-line reference landing path can be produced, that its position and direction can be maintained independent of changes on the ground surface, and that by the use of overlapping beams modulated with distinct audio frequencies, it is possible to establish off-course signals in the vertical as well as horizontal directions.

It is planned to use marker beacons, whose intersections with the landing path will establish altimeter readings. Further, the glide angle of the landing path may be changed, by adjusting the horns, to accommodate the requirements of different classes of aircraft.

The Cathode-Ray Indicator

The remaining, and highly important, problem is the one of indicating the glide path and its relation to the plane, on the instrument panel of the ship. Here Metcalf's original idea of three transmitters has been extended and simplified. Through the original suggestion of Dr. W. M. Hall of the Electrical Engineering Department, orientation from gyro instruments in the ship is combined with the landing path indicator, with the result that only one transmitter is needed. This transmitter establishes the landing path, and serves as one of the three points. The other two points are obtained directly from instruments already in the airplane, the artificial horizon and the gyro compass. The indications of these instruments, that is, the tilt and direction of the plane, can very readily be used in blind landing to establish a reference line along the horizon and to fix a point through which the line passes. The difficulty is that the indications come from separate instruments and are not coordinated with the glide path indicator.

To avoid these difficulties, the indications of the artificial horizon and the gyro compass are *transferred electrically* to the face of a cathode-ray tube, where they appear together with the indications of the glide path receiver. On the face of this cathode-ray tube appear three spots of light, one representing the glide-path transmitter and its position with reference to the axis of the plane, the other two representing points, on a line parallel to the horizon, which are contained in the reference plane. The pilot observes these three points, and by visualizing the reference plane as passing through them, he is enabled to make a landing entirely independent of the direct visibility of the airport surface. In practice the three points are kept on a horizontal line, the center point equidistant from the other two; as the plane nears the ground, the outer points move slowly away from the center.

The cathode-ray tube is sufficiently new to aviation practice that many of AVIATION's readers may be unfamiliar with its principles of operation. As shown in the diagram the tube is an evacuated glass structure, having much the shape of a funnel, with a closed face. The inside surface of this face is coated with a thin fluorescent layer of zinc orthosilicate. A stream of electrons, generated at the narrow end of the tube, is directed toward the coating, where it produces a spot of light. The direction of the electron stream may be altered in a horizontal as well as vertical direction by applying direct or alternating voltages to two sets of "deflecting plates" within the tube. These changes of direction alter the position of the spot

of light, produced on the fluorescent screen, moving it vertically or horizontally as desired. In addition, the spot may be erased altogether by interrupting the electron stream with a control voltage applied to the control grid of the tube. The action of deflecting and interrupting the spot of light is accomplished almost instantaneously, and as a consequence it is possible to interrupt and deflect the beam at an extremely rapid rate. Although the tube itself can produce but one spot of light at a time, it is possible to produce the illusion of three spots by utilizing the persistence of vision of the eye which gives the illusion of three spots of light from three successive positions of a single spot. The voltages which erase and deflect the spot in the proper succession are applied to the tube through a motor-driven cam-operated switch, the rotation rate of the switch being about 30 revolutions per second. Part of the important contribution of the M.I.T. staff to the problem has been the development of a satisfactory switch which will operate continuously without failure.

The cam-operated switch is so arranged that when the center spot of the three-spot system is produced, voltages are applied to the deflecting plate which move the spot left-or-right or up-or-down according to the signals received by the glide path radio receiver. This is accomplished by rectifying the four audio frequency modulation frequencies and applying them through the proper coupling circuits to the vertical and horizontal deflecting plates of the tube. Consequently the center spot is caused to move so that its position indicates the position of the plane relative to the glide path. If the spot is to the left of the center of the fluorescent screen, the plane is to the right of the glide path; if it is below the center, the plane is above the path, and so on.

Spots from Gyro Instruments

The remaining two spots on the screen are controlled by electrical indications from the Sperry artificial horizon and Sperry gyro compass. The voltages employed for deflection in these cases are obtained by voltage dividers mounted directly within the cases of the gyro instruments. The resistance windings of these dividers are wound on curved cards situated concentrically about the center of rotation of the gyro system. Fastened to the gyro element itself are two extremely light and fine "catwhiskers" of tungsten wire which bear lightly upon the resistance wire on the stationary cards. The friction of these wires against the resistance wire is so slight as to produce a negligible effect (as indicated by very careful tests) on the action of the gyro, but at the same time sufficient to give a positive electrical contact with the resistance wire. As the gyro element rotates with respect to its frame, the voltage between one end of the resistance wire and the catswhisker contact is made to vary in direct proportion with the angular deviation.

In the case of the gyro compass a direct voltage is applied to the terminals of the resistance winding, and the portion of the voltage taken of by the catswhisker is applied to the horizontal deflecting plates of the cathode ray tube. As the compass deviates to the left or right of the reference position, the deflecting voltages cause the two outer spots of light to move bodily to the left or right. In this way, the compass indication is transferred to the face of the tube so that it may be used simultaneously with the landing path indication.

At the same time potentials are obtained by a similar voltage divider from the artificial horizon gyro. In this case the voltage is of an alternating character and is so applied to the vertical deflecting plates that the two outer spots are moved up and down according to the tilt of the gyro element with respect to its frame. In consequence, the line connecting the two outer spots tilts away from the horizontal in direct proportion as the gyro element deviates from the wingline of the ship.

Advantages of Cathode-ray

This extremely ingenious combination of instruments has several obvious virtues. It combines compass and horizon indications on one indicating instrument, an arrangement to be desired under any condition of flight. Secondly, it coordinates these indications with that of the glide-path indicator, again on the face of the same instrument. The pilot is thus enabled to make an instrument landing on the same instrument he has been watching, for gyro and horizon purposes, throughout the flight to the airport. The fact that the indications are transferred electrically, over wires which may be of any convenient length, permits the mounting of the gyro compass and the artificial horizon wherever convenient on the ship, and not directly on the instrument panel as has been heretofore necessary. It is possible to give compass and horizon indications in several positions, on the ship, if desired. The cathode-ray tube itself has been developed from its early status as a laboratory instrument to a rugged piece of flying equipment capable of withstanding the abuse to which any of the conventional airplane instruments can be subjected without damage.

The M.I.T. staff working on the project has developed a variation of the three-spot indication which shows promise. A bar of light, representing the horizon, is produced on the cathode-ray tube by applying an alternating voltage to the horizontal deflecting plates. This line is shifted bodily left or right by the control voltage derived from the voltage divider associated with the gyro compass. The angular tilt of the line is similarly derived by the action of the voltage divider associated with the artificial horizon. In addition, a small circle of light, produced by a combination of alternating voltages, is caused to move left or right, up or down, according to the glide path indicator associated with the radio receiver. By keeping the circle centered on the center of the bar, and by maintaining the bar centered and level, the proper attitude of the ship for landing is maintained.

It may be thought that the equipment required for producing the various potentials and for switching them at the proper intervals is very heavy and cumbersome. This is far from the case. While the equipment has been designed primarily for use in transport ships, which allow sufficient space and weight for the installation, it is adaptable to smaller ships. A supply of 110-volt 60-cycle alternating current is required for operating the equipment in its present form, but this can be obtained, if not available from the regular ship supply, by employing a vibrator or dynamotor supply. The experimental equipment has been operated from a dynamotor to simulate aircraft conditions.

As has already been stated, the system is still in the experimental state, and much work remains to be done before flight tests can be undertaken. The progress thus far made is worthy of praise not only for the men actively developing it, but for the Bureau of Air Commerce for its active moral and financial support of a project initiated by one of its own engineers.

Editor's Note: AVIATION *will keep its readers informed of progress as new information is made available.*

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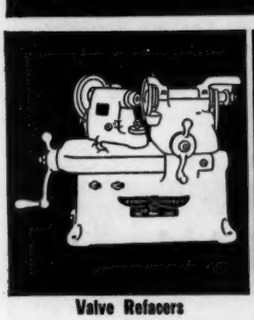

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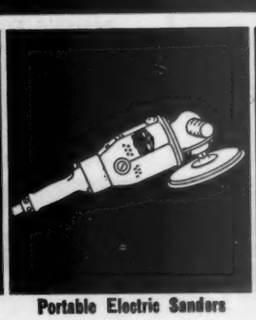

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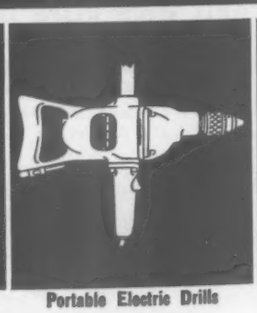

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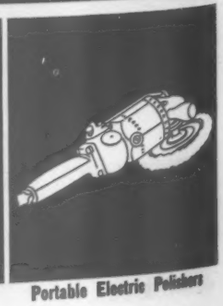

Portable Electric Polishers

National Air Races

(*Continued from page 27*)

four planes in this race, but shes a cinch to do no worse than fifth, and may pull a surprise. A surprise for some of the boys will be to find Earl Ortman at the controls during the Greve race. When Ortman shifts to his big job for the Thompson, Elmendorf will fly the Rabbit.

Now we come to the Crosby CR-4 all-metal racer. Crosby has constantly threatened to burn up the air, but has never quite produced. He has lived through more troubles than any three other race pilots. His original ship carried him through a series of mishaps in 1936, winding up with a crash that wrecked the plane completely and put Harry in the hospital for six months. Since then he has returned to the wars and built a complete new racer, quite similar to the original in appearance, but quite different in detail. The only all-metal race plane in the offering, the Crosby pays for this honor in extra weight, giving it the penalty of carrying the highest wing and power loadings of any racer in the Greve. With a sharply tapered, stubby wing, it has a span of 16 ft. even, length of 21 ft. 6 in., wing area of 64 sq. ft., and gross weight of 1940 lbs. A clever "mouse-trap" landing gear retracts completely into the low wing.

The landing gear is air operated, by means of a Lux air bottle which will give six retractions and extensions before recharging. Like the Schoenfeldt Firecracker, the Crosby racer has skin type oil radiators. It is also the only in-line powered racer to mount an exhaust manifold. Winding up the series of misfortunes he has suffered, came a bout with a collapsing landing gear on his first test flight with this plane, a spell of aileron flutter in the air, a fire on the ground, and finally a bad ground loop that damaged both the landing gear and wing somewhat. But Crosby has smiled and worked his way through his troubles and should be at Cleveland big as life. If everything clicks this plane may be among the first three, might well win the race, but we suspect it will wind up no better than fourth.

Perhaps we have overlooked a bet in not placing the Delgado Flash higher. This Menasco C6S4 powered racer was at Cleveland last year, but had engine trouble and did not accomplish much. Since then Byron Armstrong has made a number of improvements which enabled Clarence McArthur to set a record of 207.027 m.p.h. for the 100 kilometer closed course distance in a time trial at New Orleans June 26th. The Delgado Flash is a low wing monoplane of clean lines except for the fixed landing gear with rather bulky fairings. This ship may do as well as fourth or fifth place if running right, but we do not consider it fast enough to merit ranking ahead of Crosby.

Another possibly under-rated contender is Marion McKeen with his veteran Brown Special Miss Los Angeles. McKeen has completely rebuilt this plane, replacing the wire braced wing and fixed landing gear with cantilever wood wing and retractable landing gear, and has probably gained some speed.

Miss Los Angeles must be rated as a pretty lively old maid who has had her face lifted and may go places in surprising fashion.

A newcomer to the Nationals will be Russ Chambers with his 326 cu. in. racer which was dubbed the Chambermaid by newspaper men at Oakland. The Chambers racer is unique in more ways than one. It mounts the only Menasco B4S engine in existence, as the Menasco small four cylinder engine has never before been supercharged. An outstanding feature of the plane is the retractable landing gear, which is extremely compact, and incorporates spring leaf shock struts reminiscent of Wittman's designs. Russ considered naming his racer the Parlormaid because he actually welded the fuselage in his home, which shows what the wives of race plane builders have to put up with. The plane is of high mid wing design with a cantilever tapered wood wing, and steel tube structure for the fuselage. Length is 17 ft. 3 in., span 13 ft. 8 in. and height insignificant. Russ has to guard the plane constantly to keep people from stepping on it accidentally. It is easily the smallest race plane in its class. Total wing area is 44 sq. ft. and gross weight 1075 lbs. The plane is very clean and should be able to qualify for both the Greve and Thompson Trophy races. However, against such sterling competition as he will face Russ can hope to do no better than keep the plane running and take whatever prize money is left.

In much the same category as Chambers is the Rider Racer entered by Charles McGrew. This plane is an old timer of typical Rider design, and mounts a Menasco C4S engine. The plane has been overhauled, in fact rebuilt, and may be fast enough to beat Russ Chambers, but there its potentialities would seem to cease. We may see a nice race for last place between the McGrew and Chambers entries. Chuck McGrew, wealthy young sportsman, is rumored as the pilot of his own entry. This is the plane that Earl Ortman broke in on.

A final possible Greve contender is the Tom Floyd racer being built in Inglewood, Calif. This plane is a refinement of the Chambers design, but mounts a Menasco B6S engine of 489 cu. in. displacement. Like the Chambers racer, the landing gear pulls up vertically into the fuselage into compact wheel wells, but hydraulic shock struts are used in place of the leaf springs incorporated in the Chambers design.

All in all the Greve race this year should be, from a purely competitive standpoint, the finest race in air race history by a wide margin. And the same thing exactly should be said of the Thompson Trophy, for in the Thompson will be all of the planes just listed, plus a number of interesting big fellows.

The new rule prohibiting Bendix racers from flying in the Thompson will keep Fuller's and Cochrane's planes from competing at Cleveland but we suppose that Ray Moore and Frank Sinclair may be drafted to fly other Seversky, or similar semi-military planes. Such ships should be able to average around 260 m.p.h. for the race, which would put them within shooting distance of the four 544 cu. in. racers that we rate at the head of the Greve parade. Also rating about the same spot is Turner's modified Wedell-Williams, which will again be flown by Lt. Joe Mackey. But ahead of all these planes should be listed the sterling four racers which may be expected to provide the big thunder in the Thompson—always excepting the rather strong possibility that some of the little Greve racers will sneak out in front again just as Rudy Kling did last year.

We think Earl Ortman deserves the favorite spot in the Thompson Trophy race this year. Earl has taken second in the Thompson two years in a row and also won second Bendix money last year. This year at Oakland Ortman cleanly defeated Turner's Twin Wasp racer in a

closely fought pylon duel. Since then the Marcoux-Bromberg racer flown by Ortman has been further enhanced by mounting a second oil cooler, by improving the fuselage lines with a wood superstructure directly aft of the bulging engine cowl, and in a number of other ways. The crew that has worked with this plane is confident that it is capable of averaging around 300 m.p.h. so we may see quite a race.

Right up among the Thompson leaders this year, or ahead as in 1937, should be S. J. Wittman in Bonzo. Wittman has spent many weary days completely rebuilding the cooling system on this plane, which mounts a Curtiss D-12 liquid cooled engine. A win for Wittman would not be an upset, as he has had some bad luck in the past and this may be his turn to strike pay dirt. General features of the Wittman racer are well known. Chief feature is its barn door appearance which makes people feel, when they see it out in front of prettier airplanes, like the man who saw a giraffe for the first time and flatly insisted that "There ain't no such animal." In Wittman's case we can't laugh off the truly amazing speeds he has put up with what looks like a pile of junk. Among other design lessons to be learned from Wittman are the importance of working for good sense ahead of good looks, and also the proof that fixed landing gears can be just as clean as retractable gears, everything considered. Wittman saves so much weight with his simplified spring leaf gear, and it presents so little drag that he is able to make up in light weight of the plane what little he loses in head resistance of the wheels.

As in the past, Roscoe Turner will have his Turner-Brown-Laird racer right up among the leaders. This ship has previously been described but we'll repeat that it is a mid-wing cantilever monoplane with fixed landing gear. Powered with a Twin Wasp engine the plane is rather large and heavy and has not lived up to advance hopes as to its straightaway speed. Originally built for Turner by Lawrence W. Brown, the plane was later completely rebuilt by Mattie Laird.

Final figure among the new racers is the Curtiss-Conqueror powered Mr. Smoothie built by the Pearson-Williams Airplane Co., of Venice, Calif., and to be flown by Lee Williams. This plane is sponsored by Mrs. Edith Boydston Clark, herself a pilot although a woman sixty years of age, who sponsored the Rider racer which is now raced as the Marcoux-Bromberg. Pearson and Williams have brought together a galaxy of experienced speed plane workers and the results should prove interesting, if not startling. The Pearson-Williams entry may well lead the whole parade by a wide margin. At this date the plane has yet to be test flown, but it is substantially complete and should be at Cleveland. Design work on Mr. Smoothie was shared by C. R. Pearson and Rodney Nimmo, both of whom have worked with Keith Rider on various race planes. The ship is of distinctive type, however, being a high mid-wing cantilever monospar monoplane, with landing gear that retracts into the fuselage much like the Folkerts racers. The wing is all wood, while the fuselage is of steel tube construction with a smooth plywood shell covering. Cowling of the engine has been very neatly handled. Cooling air for the prestone radiator is brought in through a hollow propeller spinner and distributed over a circulator radiator much as on Wittman's Bonzo. Carburetor air is taken from a smoothly built scoop at the top of the engine cowl and air for the oil cooler is taken by a similar scoop at the bottom of the cowl. Wing span of the plane is 24 ft., length 26 ft. and wing area 95 sq. ft., gross weight is 3,080 lbs. Lee Williams is a newcomer to air racing as a pilot, but has been associated with Marion McKeen as mechanic for a number of years. We believe this plane is potentially the fastest slated to appear at Cleveland this year. But we count on the first-year troubles that usually beset new designs to keep it from hitting top form its first time out. We may be fooled, but Williams will have to hit somewhere near 300 m.p.h. for the Thompson Trophy distance to win.

Space has not permitted a detailed description of the new planes to be seen at Cleveland so we should like to repeat our plea to all open-minded designers that they get around these racers as closely as possible in order to observe at first hand the really commendable design work that has been done in most cases.

Aircraft Armament

(*Continued from page 35*)

enemy aircraft would be a distinct advantage to the plane having the longest range guns and high muzzle velocities. In the position, stated, the combat plane would have a high concentration of fire having at least 4 guns trained on the target. Sufficient stress cannot be placed upon making each gun independent and flexible, with a large field of fire and range together with good vision for the gunner. Over-lapping angles of fire for all guns, to insure good coverage will surely follow.

Objection has been raised to lateral fire and its difficulties, since the bullets are deflected by the slipstream and windstream caused by forward velocity. However the possibilities of firing atwartship have been demonstrated. The position described above, has a slight benefit since it reduces the errors due to cross fire. The lower gun positions are becoming more appreciated as good defensive and offensive posts. (C) shows a gun mounted in such a position. In this installation, the gun is mounted on a rotating ring interconnected with the gunner's seat; the entire mechanism being rotated by manual or mechanical means. It is seen that in an installation of this type the gun has a large cone of fire and is very flexible, at the same time relieving the strain on the gunner.

Mr. Rogeron has pointed out (AVIATION, April 1936) that the modern high speed planes give the gunner little time to sight his gun and that speeds of military airplanes are almost faster than the speed of transmission of light sensation from the optic nerve to the brain of the gunner. While the distance between planes (100 ft.) assumed by Rogeron is close for modern planes, the point in question should be given serious thought i.e. vision for gunner.

A necessary accompaniment to a good gun installation is a good field of view for the gunner. He must be provided with a field of view that is comparable with or greater than his field of fire and which will enable him to keep up a constant curtain of fire along that sector which is assigned to him. It is essential that large areas of window space be provided at each gun position. A gunner cannot be expected to aim his gun correctly if there suddenly appears in his range of vision an airplane

(*Turn to page 80*)

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(*Continued from page 78*)

whose angular velocity may approach 100 to 137 deg. per sec. All he might be able to do is say, "There goes one." With sufficient view, however, he has a better chance of spotting the airplane and he will have the target in his vision a longer period of time. Even if he only gets in one shot it would have a greater chance of being effective, especially if it is a explosive shell. The advantage of guns of high muzzle velocity can readily be realized from the following example.

If we assume a combat plane diving at 300 m.p.h. upon a bomber proceeding at 250 m.p.h. (Fig. 2.) the angular velocity at which the combat plane will cross a line 500 feet away from the bomber's path is:

$$W = \frac{126 \times 1.1466 \times 57.3}{500} = 21.2°/\text{sec.}$$

W = angular velocity $= \frac{V}{r}$; V = resultant velocity = 126 m.p.h.; r = distance between planes.

We see that the greater the distance between planes the less the angular velocity. Therefore the airplane that can open fire at long range has the advantage.

There still remains among the major problems of armament and guns, the need for a suitable recoil mechanism for the light machine guns, particularly the 50 cal. type. Such mechanism must be incorporated to relieve the physical strain and allow the gunner more accuracy in sighting. He cannot sight efficiently if his gun is recoiling so violently that the sights are constantly vibrating. For this purpose, an oleo-pneumatic shock absorber incorporated in the gun mount should serve to take up recoil shocks. In the larger guns, the recoil mechanism is designed into the gun and shocks are much less, another point in favor of the large gun. A second problem and one which has many difficulties is that dealing with sights. Sighting apparatus has lagged considerably behind airplane and armament design. Doubtful accuracy can be had with present types of wind vane sight when used on the high speed plane; the gunner relying on tracer bullets to determine his corrections. Sights must be designed to allow the gunner to make his necessary ballistic and aerodynamic corrections for speeds of planes, deflecting air currents, distance between planes, etc. without taking more than a fraction of a second. The sights should be fixed relative to the gun, although independent of their recoil in much the same manner as the rapid-fire cannon or anti-aircraft gun.

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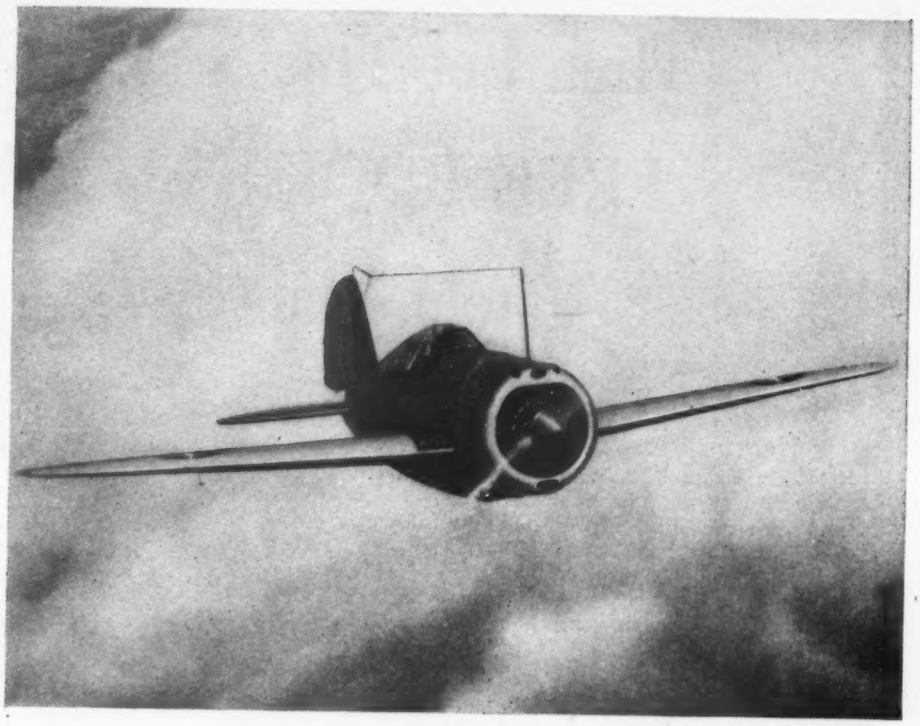

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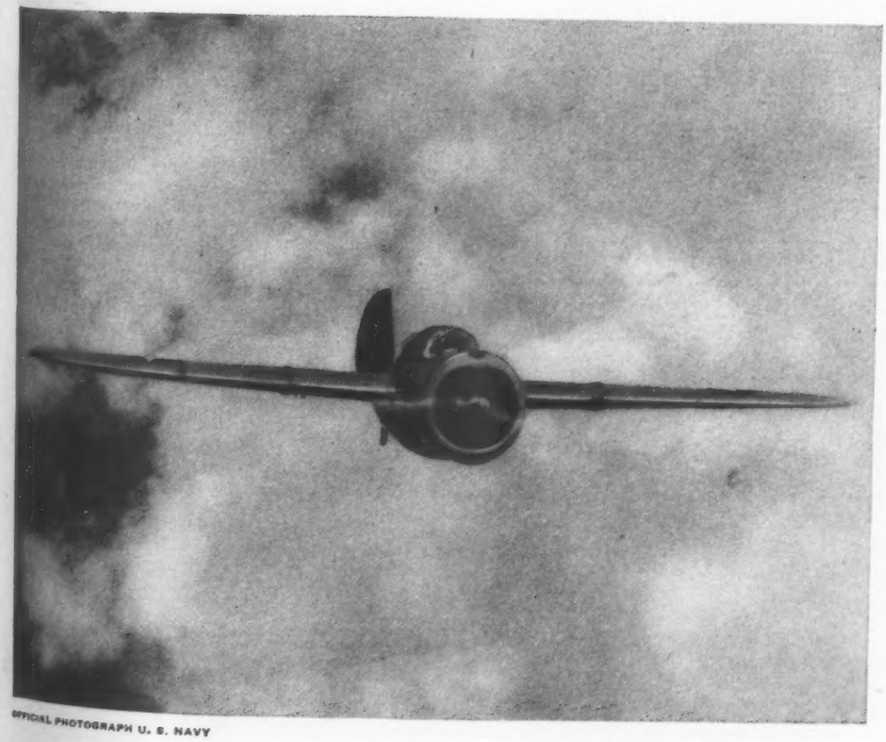

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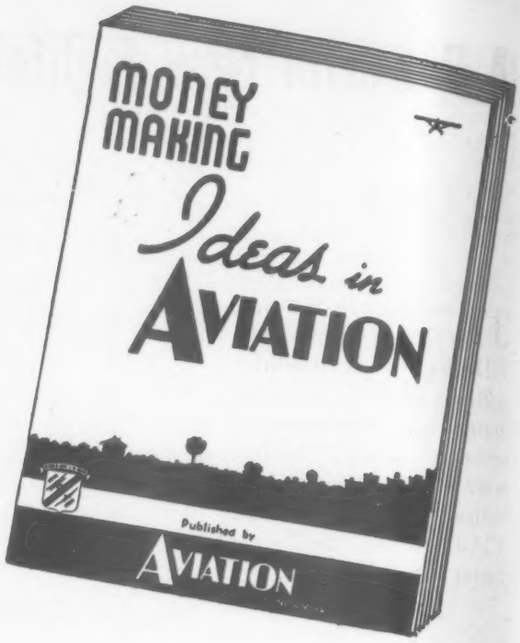

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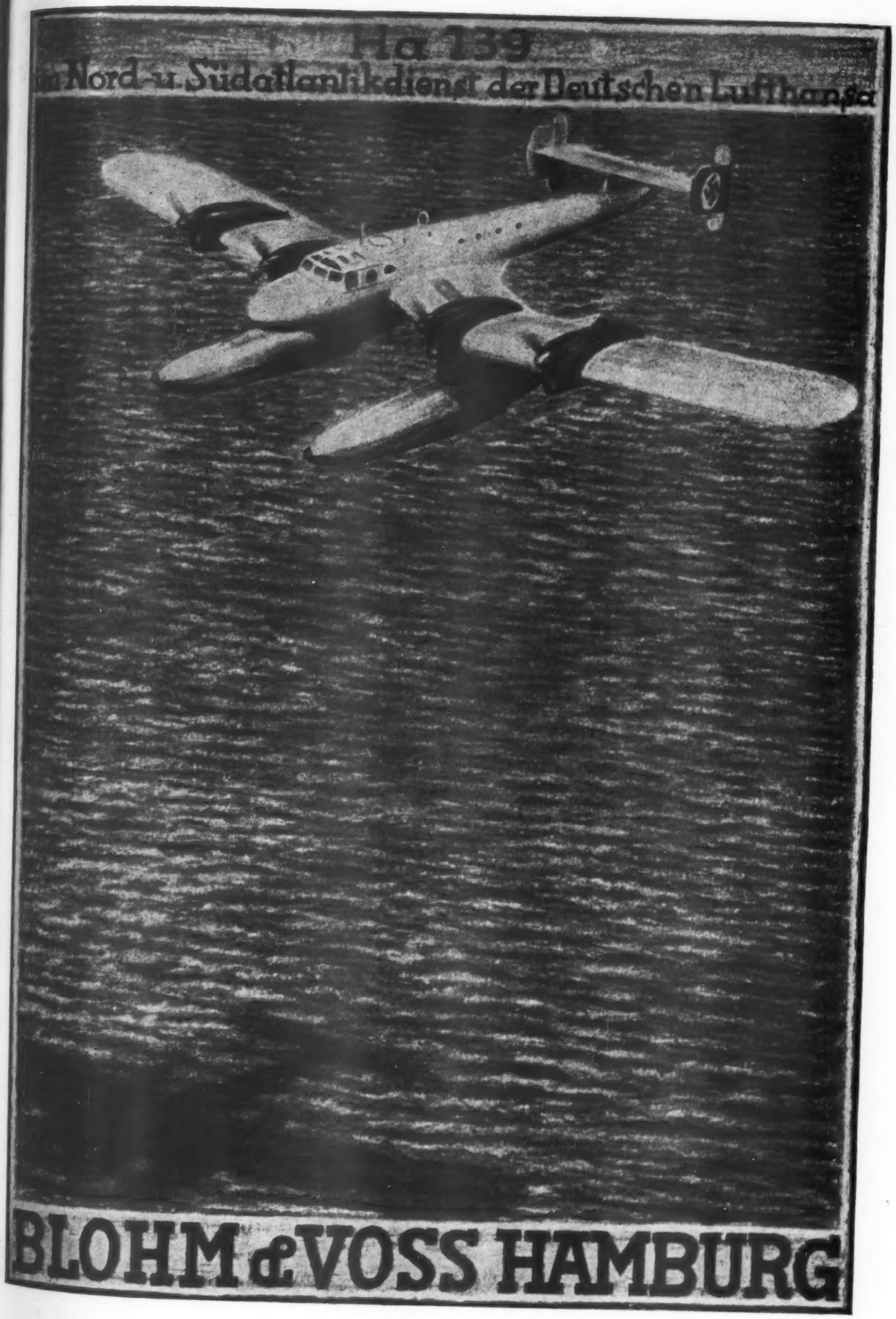
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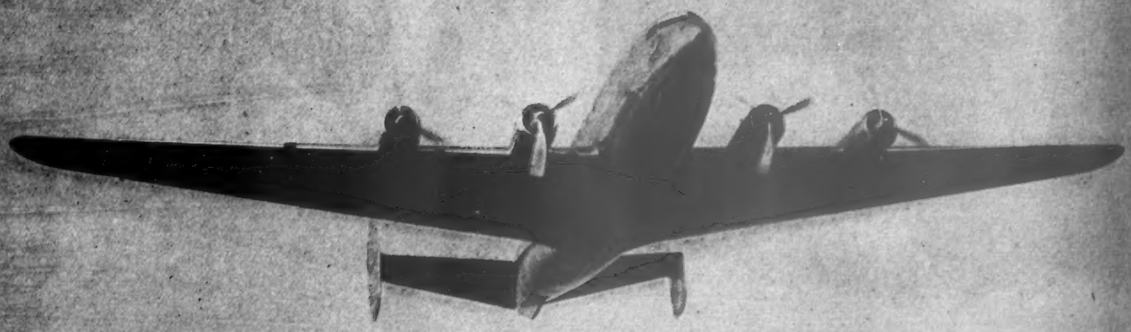

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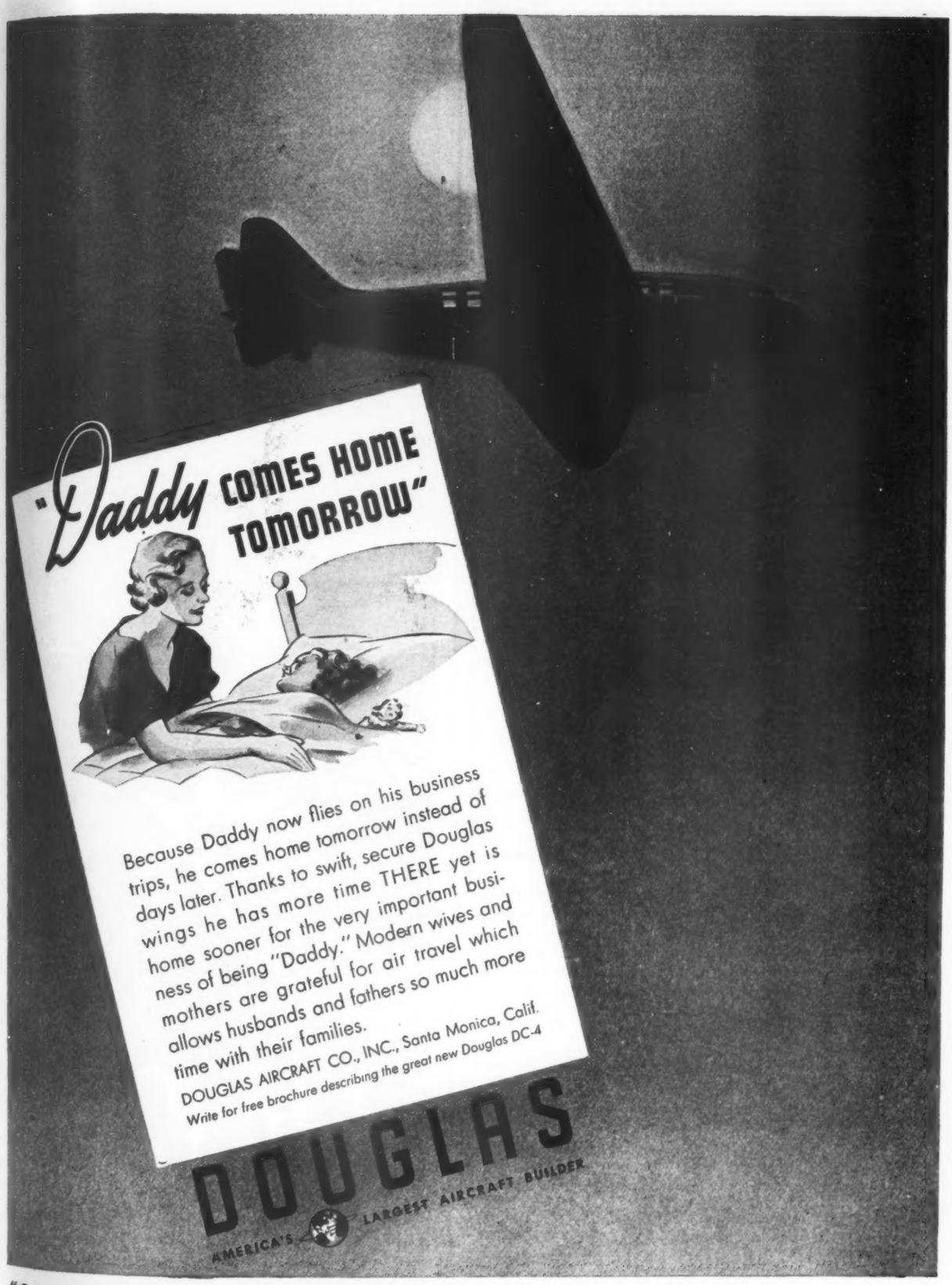
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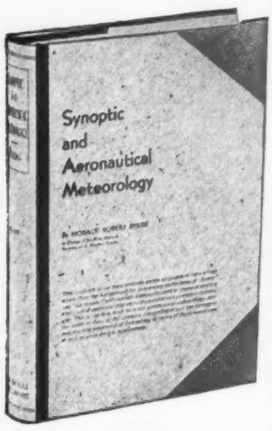

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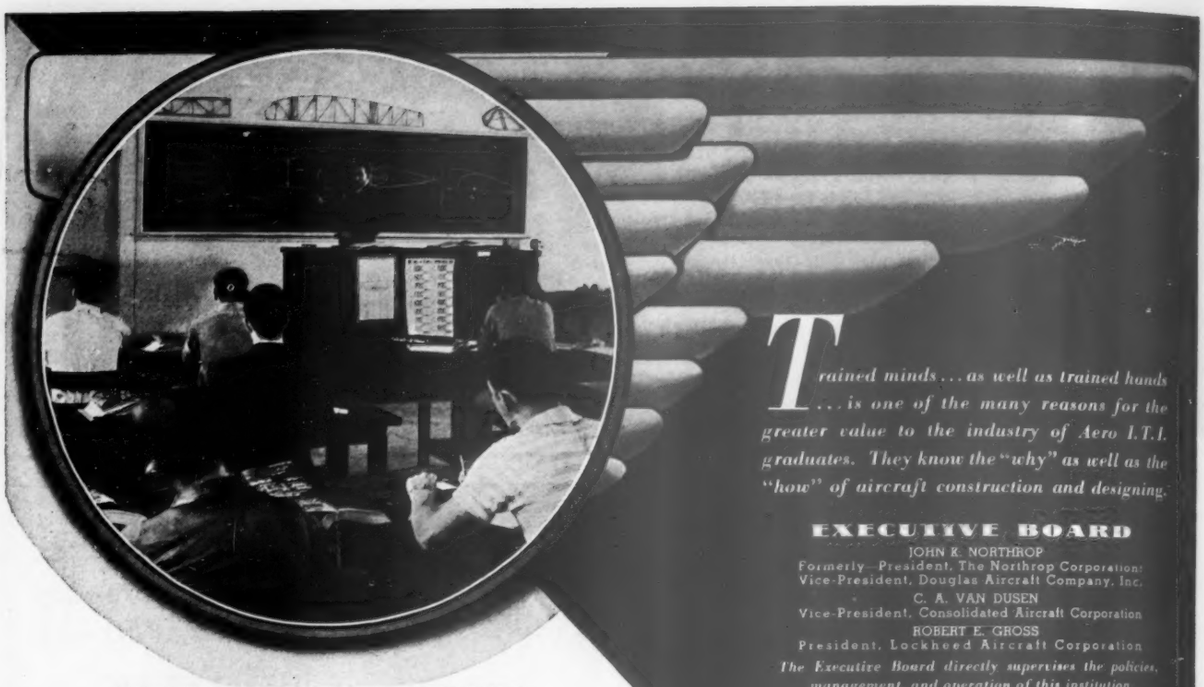

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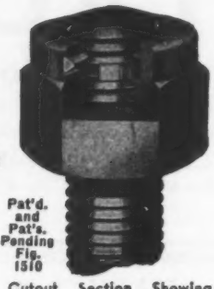

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POSITIONS WANTED: (*See Classification*)

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EAGLEROCK A4, Wright Simplex engine, licensed, excellent condition, special paint job, Bendix brakes, total time less than 200 hours with extra model E Hisso prop and miscellaneous parts and tools and two Irving standard 24 ft. seat pack silk parachutes. $1000.00. T. B. Herdon, Mansfield, La. (P)

AVIATION'S MARKET PLACE

Eaglerock — Continued

EAGLEROCK, OX-5, Licensed until August 1939. Color, red and silver. New Fahlin propeller. Engine approximately 40 hours since major, $250. Must sell. Wm. L. Shepard, 108 Fayette Ct., Peoria, Ill.

HISSO EAGLEROCK A-3. Wheel brakes, 50 hours on engine since major; no time on ship since complete overhaul. $375. Philip C. Pederson, Elbow Lake, Minn. Box 514.

Eastman

EASTMAN AMPHIBIAN excellent condition, motor majored, $1500.00. New Orleans Air Lines, 1131 Lesseps Street, New Orleans, La.

Fairchild

FAIRCHILD 1936 three place Warner 145. Majored 100 hours ago, privately owned, flaps. Fabric and motor in perfect condition. Asking $3,500. George Vaughan, Jr., Boulevard Airport, Phila, Penna.

FAIRCHILD 24 1938 Wagner four-place, forty hours, new ship guarantee, deluxe interior, generator, starter, brakes. Will accept trade terms. Weddell & Smith, City Airport, Detroit, Mich. (T)

FAIRCHILD 22 C7E, 1934, Warner Series "40" 125 H.P. engine, air starter, Hamilton prop., wheel pants. No time on ship and engine since overhaul. Licensed to May, 1939. Leoning yellow, black trim, high gloss. Price reasonable. State Trade School, Putnam, Conn.

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FRANKLIN SPORT VELIE 65 H.P. Motor just majored. Finished in all yellow. Excellent condition. Extras. $695.00. Can finance. Al Leeward, New Kensington, Pa.

Kinner

BIGGEST BARGAINS EVER OFFERED in up-to-date used Kinners. See display ad page 95. E. W Wiggins Airways, Inc., Providence, R. I.

Lockheed Orion

TWO LOCKHEED ORIONS: Excellent condition, fully equipped, just relicensed. Inland Air Lines, Box 1511, Casper, Wyoming.

Monocoupe

MONOCOUPE: 125 HP front exhaust Kinner; airwheels. Perfect shape throughout; $1,100.00. J6-9 engine, modernized, 50 hours since top overhauled; excellent running condition; $600.00. Jerry Wood, 1238 N. Lombard Avenue, Oak Park, Ill.

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PORTERFIELD-WARNER 90, 200 hours total. $1,950.00. Porterfield LeBlond 70-75, total hours. $1,650.00. Both have position lights, tail wheel, brakes, battery, compass and new in September, 1937. Privately owned. Excellent condition. Cincinnati Aircraft Service, Lunken Airport, Cincinnati, Ohio.

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ONE CURTIS ROBIN OX 5-cabin, 3 place. Licensed, recently overhauled, new paint, very good condition. Cheap. Price F.O.B. Lake Delton Airport, Lake Delton, Wis. Write for particulars. R. M. Hines, Delivlew Hotel, Lake Delton, Wis.

Spartan

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STEARMAN C3B Wright 220 H.P. Ship and engine in excellent condition; leading edges strengthened battery and generator. Many extras. $1,400.00. F. E. Smalidge, 1133 Washington Ave., Wenatchee, Washington.

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1934 STINSON, 620 total time, 24 hours since complete major overhaul, ship is perfect, $2,500.00 cash. J. Tyler Thomas, 170 Cochran Road, Lexington, Kentucky.

STINSON U Tri-motor—just refinished. Looks brand new. Best looking "U" in the country. $3500.00 or trade. Joseph Lenard, 5126 West 63rd Street, Chicago (T)

1934 STINSON SRS RELIANT. No time since complete motor major, just relicensed. Absolutely must be seen to be appreciated. Never cracked. Real bargain. Can finance. Al Leeward, New Kensington, Pa.

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OX5 SWALLOW type 21, licensed till Dec. 15, 1938, New Flottorp Prop, duals, Goodrich airwheels. $300! Forest Days, Copley, Ohio.

Taylor (Cub)

CUB, late '36. Motor majored. Hand rubbed finish. Total time 195 hours, none since overhaul. New Prop and tires. $850. Leroy Murphy, Municipal Airport, Springfield, Illinois.

1937 DELUXE CUB SEAPLANE, landplane, Edo floats, dual ignition, metalized, entire outfit excellent. Can finance, bargain, Al Leeward, New Kensington, Pa. (P)

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Taylorcraft

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TAYLORCRAFT-STANDARD, green with yellow trim. 732 hours total, 160 since major. New tires and windshield. Licensed till July 1939. $850.00. Cincinnati Aircraft Service, Lunken Airport, Cincinnati, Ohio.

TAYLORCRAFT, year old, 165 hrs. black red trim, never cracked, compass cabin heater, tail wheel cool cowl, bail bank, always hangared. $1025.00 Larry Geer, Ft. Dodge, Ia.

TAYLORCRAFT like new with few hours and many extras, pants, compass, tail wheel, etc. Reason for selling, family trouble. Any reasonable offer considered. David Goetz, 620 Summit Ave., Hagerstown, Maryland, Henson Flying Service, Hagerstown, Md.

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TRAVELAIR 4000—J-5 Mount complete less engine. Good condition. Tail wheel. Extra instruments. Priced right. Two Irving seat type Parachutes. E. M. Laird Airplane Co., 5919 S. Cicero Avenue, Chicago, Illinois.

Waco

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Waco — Continued

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Used Planes—General

(See also Group Classifications)

Ryan B-5, wing recovered, motor majored, very good condition, $1,400. 1934 Lambert Monocoupe, 305 hours total time, $1,700. Standard Aviation, Inc., Bendix, New Jersey. No. 1

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Used Planes General (Cont')

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WILL TRADE 1933 Willys Coupe and cash for a Buhl pup Curtiss Jr. or Heath Kit or what have you. Mike Amedeo, Gasport, New York.

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U. S. Government

WAR DEPARTMENT, Office of the Contracting Officer, Air Corps, Materiel Division, Wright Field, Dayton, Ohio, June 24, 1938. To: Airplane Designers and Manufacturers.—The War Department invites the submission in competition by sealed communications of new designs covering Single-Engine, Radio-Controlled Target Airplane complete with all ground control and operating equipment, together with statement of price for which any such design in whole or in part will be sold to the Government. Communications containing designs and prices therefor must be submitted to the Contracting Officer, Wright Field, Dayton, Ohio, not later than November 16, 1938; no communications received after 1:00 P. M. Eastern Standard Time on said date shall be considered. Winner or winners of this competition will be determined as provided in the Act of July 2, 1926 (44 Stat. 788). The Government will require not to exceed one hundred (100) of the type of airplane referred to and will reserve the right to contract with a winner of the design competition for the construction of said airplanes in the event that said winner is qualified to manufacture same. A copy of the circular proposal covering this design competition and containing instructions in regard thereto will be furnished upon application therefor to the Contracting Officer, Wright Field, Dayton, Ohio. E. T. Kennedy, Major, Air Corps, Contracting Officer.

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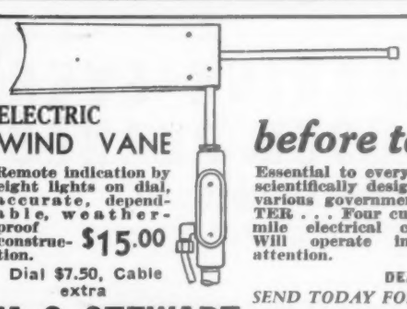

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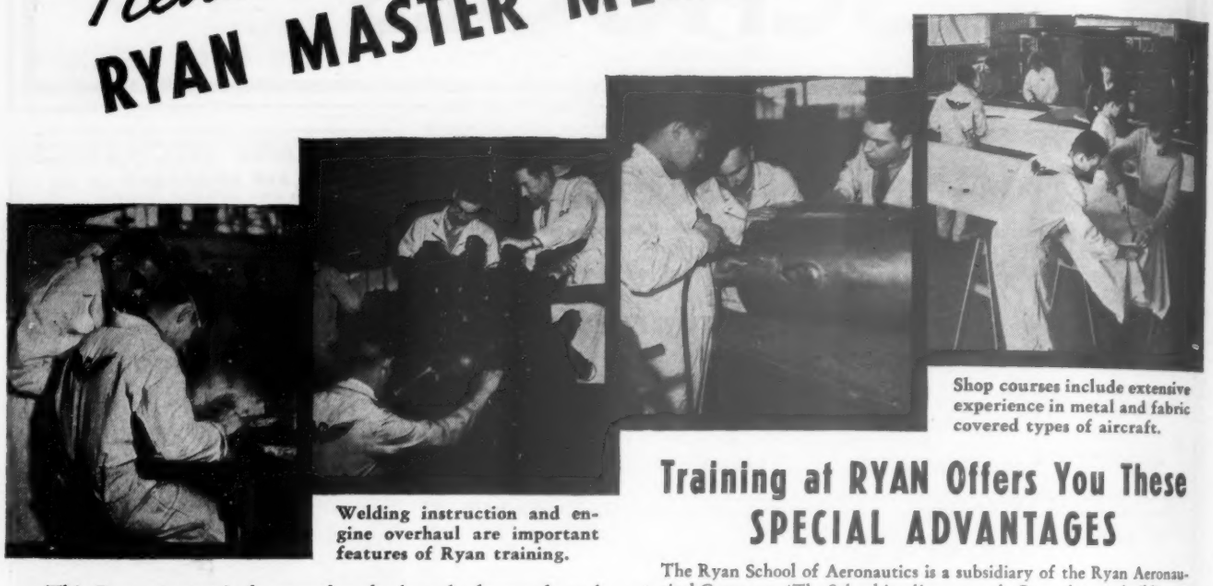

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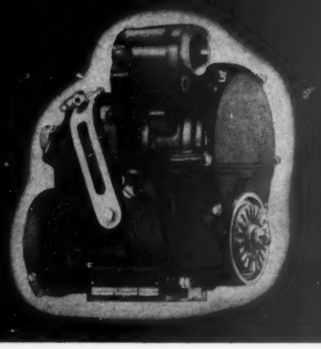

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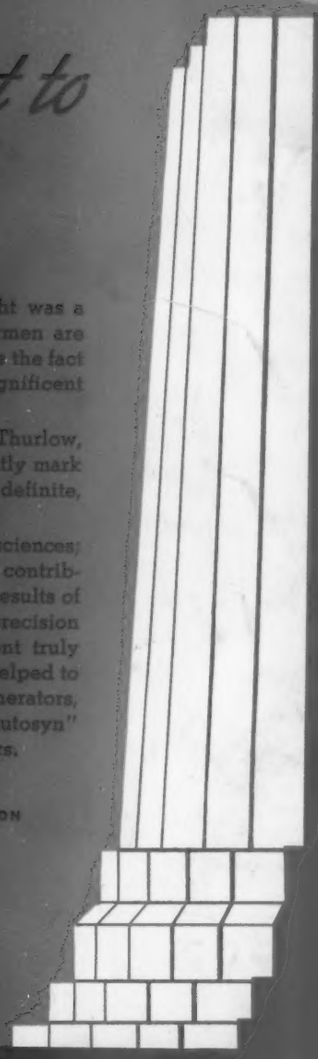
DIVISION OF BENDIX AVIATION CORPORATION
EAST ORANGE, NEW JERSEY



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